

2 ALTERNATIVES INCLUDING THE ABFS PROPOSED ACTION

2.1 PROJECT LOCATION

The American Basin Fish Screen and Habitat Improvement Project (ABFS Proposed Action) is located in the Natomas Basin, part of the American Basin, within the Sacramento Valley of California. It encompasses portions of northwestern Sacramento and southern Sutter counties (see **Figure 2-1**). The Natomas Basin is bounded by the Sacramento River on the west, the Natomas Cross Canal (NCC) on the north, the Natomas East Main Drainage Canal (also known as Steelhead Creek) on the east, and the American River on the south.

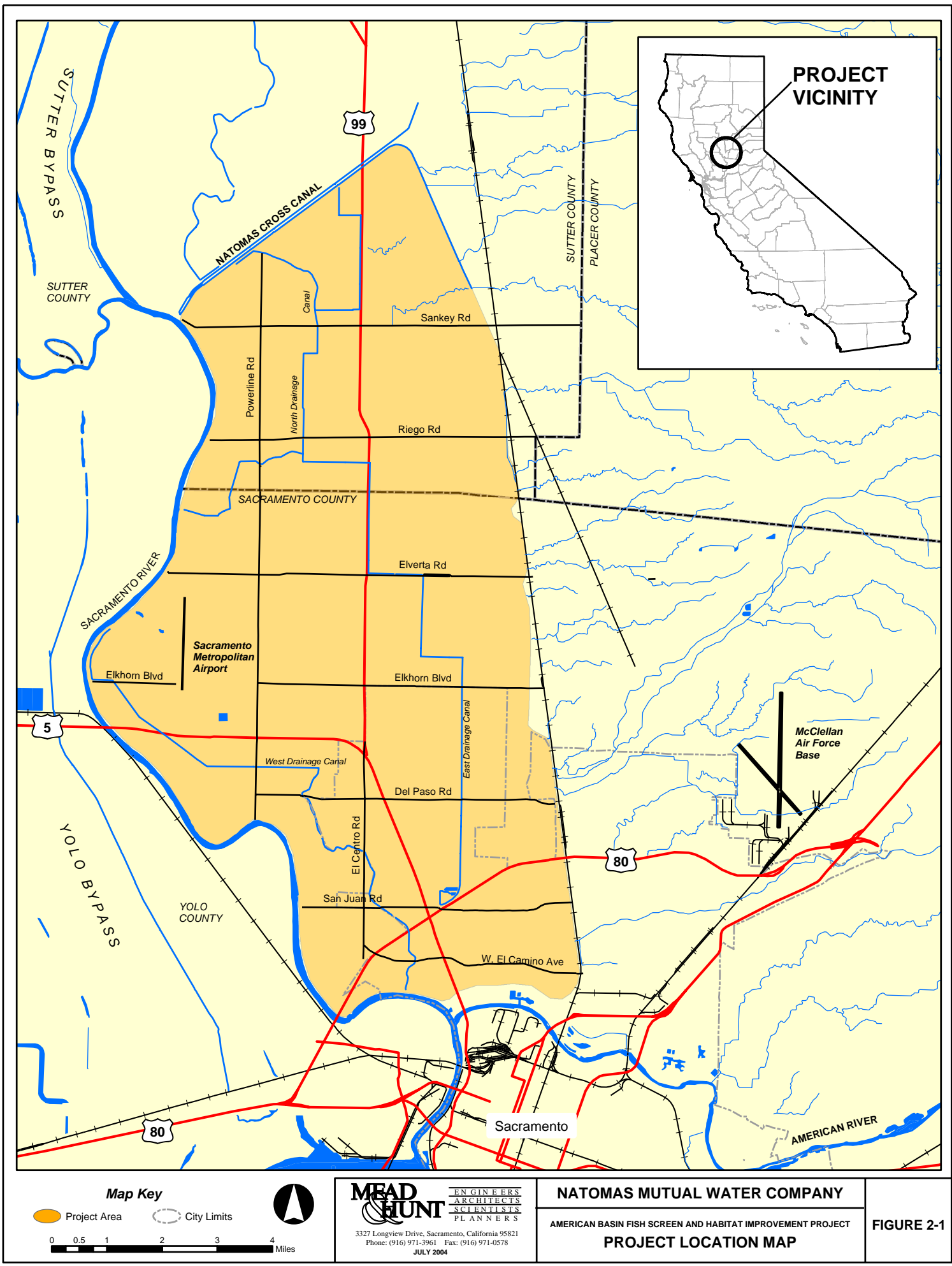
2.2 EXISTING SYSTEM AND OPERATIONS

2.2.1 BACKGROUND

Natomas Central Mutual Water Company (Natomas Mutual) is a private Mutual Water Company as defined in the California Public Utilities Code, Section 2705, formed for the delivery of water at cost to its shareholders. Natomas Mutual is subject to local land use controls, including those of Sacramento and Sutter counties and the City of Sacramento. The service area of Natomas Mutual, as defined by its contract for water with the Bureau of Reclamation (Reclamation)¹, consists of the entire Natomas Basin. Within this defined 53,537-acre service area, Natomas Mutual controls surface water rights for approximately 280 landowners who are its shareholders. Natomas Mutual diverts water from the Sacramento River and NCC to provide irrigation water for agricultural use and habitat preservation. Other uses include the supply of untreated water to the Sacramento International Airport for landscape irrigation and the supply of water for golf course irrigation.

The habitat created and sustained through the operation of Natomas Mutual's extensive irrigation distribution system, within the Natomas Basin, provides important habitat for at-risk species such as the federal and state threatened giant garter snake and the state threatened Swainson's hawk. The Natomas Mutual surface water supply sustains agriculture within the Natomas Basin, which is critical to conservation efforts within the basin. Seasonal flooding of rice fields for rice straw decomposition also provides critical wetland habitat for waterfowl. Additionally, Natomas Mutual is the water purveyor to The Natomas Basin Conservancy (TNBC), which manages over 4,000 acres of habitat preservation land.

¹ Contract for diversion of water from Sacramento River sources and for water service from the Central Valley Project.



Natomas Mutual currently maintains five pumping plants along the Sacramento River and the NCC. These pumping plants divert surface water into Natomas Mutual's service area. The five pumping plants maintain a total maximum water diversion capacity² of 630 cubic feet per second (cfs). Facility descriptions are provided below. Drainage and flood control for the Natomas Basin is provided by Reclamation District No. 1000 (RD 1000), which has a coinciding service area with Natomas Mutual and shares several joint use facilities with Natomas Mutual.

2.2.2 WATER RIGHTS, USES, AND DEMANDS

Natomas Mutual holds six water right licenses and one permit to divert water from the Sacramento River, NCC, and interior drainage system within its service area³. Natomas Mutual also holds a Sacramento River water right settlement contract with Reclamation (Contract No. 14-06-200-885A-R-1, dated May 10, 2005; hereinafter "Natomas-Reclamation Contract"), which authorizes the diversion and use of up to 120,200 acre-feet of water from the Sacramento River during the months of April through October. Of this quantity, 98,200 acre-feet is the "base supply" attributable to the yield under Natomas Mutual's water rights and 22,000 acre-feet is "project" supply from the Central Valley Project.

The authorized purposes of use under Natomas Mutual's water right licenses and permit include irrigation, domestic, municipal, and industrial purposes. However, under its water right licenses and permit, water may only be used for domestic, municipal, and industrial ("M&I") purposes within a limited area of approximately 10,000 acres within Natomas Mutual's service area. In addition, water may only be diverted for M&I purposes at one of the authorized points of diversion, Point 3 (existing Elkhorn Diversion), as designated in the subject licenses and permit. Similarly, Article 7(a) of the Natomas-Reclamation Contract provides that Natomas Mutual shall not deliver or furnish project water for municipal and industrial purposes outside a limited area delineated on Exhibit B to the Natomas-Reclamation Contract, without the written consent of Reclamation. The limited area delineated in Exhibit B is an area in the vicinity of the Sacramento International Airport for which Natomas Mutual has historically provided water for landscape irrigation purposes.

² Pumping plant capacity varies with river levels due to the increase or decrease in lifts required at various water levels. The 630 cfs capacity is the approximate total capacity of all pumps at an average historical river level during the irrigation season.

³ Licenses L1050, L2814, L3109, L3110 and L9794 with the State of California allow the diversion of water from the Sacramento River and NCC for irrigation, industrial, municipal, and domestic purposes. License 9989 allows the diversion of water from drainage canals for irrigation purposes. Permit 19400 provides for diversion of water from the Sacramento River, NCC, and drainage canals for irrigation, domestic, municipal, and industrial purposes during the winter period (October 1 to April 1).

Accordingly, in order for Natomas Mutual to serve water for municipal and industrial purposes in a larger portion of its service area, it will need to obtain (i) the written consent of Reclamation, as to project water; and (ii) authorization from the SWRCB to modify the place of use for M&I service under Natomas Mutual's water right licenses and permit. It may also be necessary to add additional points of diversion for M&I deliveries.

The Natomas Mutual water distribution system currently provides access to surface water for more than 32,000 acres within its service area. Natomas Mutual typically irrigates between 15,000 and 23,000 acres of land each irrigation season. Cropping patterns vary based upon economics, but due to the soil conditions in the region, much of the land is typically planted in rice. Ricelands typically represent between 12,000 and 18,500 acres of the land irrigated by Natomas Mutual each year.

Based upon Natomas Mutual's available surface water supply, the amount of land that can be irrigated is substantially less than the total agricultural land within its service area⁴. Applications for service are submitted to Natomas Mutual each year for the acreage of crops being planted by its shareholders.

Natomas Mutual's diversions for irrigation service typically begin after April 1. Demands gradually increase as crops are planted within the service area, with peak diversions occurring between April 15 and June 15, depending upon weather conditions. The diversions are operated at total capacity (approximately 630 cfs) continuously for a minimum of a 10-day to 2-week period at some point during this timeframe⁵. Total diversion pumping capacity is based on irrigation demand. Once crops are established, the diversion rate is nearly constant throughout the remainder of the irrigation season, at approximately two-thirds the initial demand, with minor variations based upon individual crop demands and weather conditions. This allows downtime for equipment maintenance on a rotating basis during the irrigation season. Average monthly diversions range between 15,900 and 21,500 acre-feet for the months of May, June, July, and August. Demand typically drops off at the end of August and declines at a more significant rate in September. During September, the average monthly diversion is approximately 6,100 acre-feet. The winter re-flooding of rice fields typically occurs in October and November, with

⁴ In non-drought years peak monthly diversions, within Natomas Mutual's available water rights, have been recently ranged between 20,800 to 23,900 acre-feet. Based upon current cropping patterns, this equates to approximately 23,000 to 24,000 acres of irrigated cropland that can be maintained within Natomas Mutual's existing surface water rights, out of the over 32,000 acres served by Natomas Mutual's existing irrigation system.

⁵ Natomas Mutual stages initial irrigations to maximum extent possible without running the risk of crop damage. This established practice allows Natomas Mutual to minimize its rate of diversion after initial irrigations. The initial flooding of rice crops typically demands almost twice the rate of water that is required for maintaining the established crop.

between 5,500 and 7,800 acres re-flooded each year. Due to air quality concerns, winter re-flooding for decomposition of rice stubble as an alternative to burning has increased over the past 10 years and is expected to continue to increase. Other minor demands during the off-season are associated with landscape and golf course irrigation, which total less than 10 cfs.

2.2.3 WATER DIVERSION AND DISTRIBUTION FACILITIES

Natomas Mutual utilizes two different types of canal systems to distribute irrigation water throughout the service area, including (1) those dependent on gravity flow for delivery, and (2) those dependent on pumping for delivery. The system of highline canals utilizes gravity flow to deliver water by maintaining water levels above the surrounding ground levels. This enables Natomas Mutual to deliver water from the highline canals directly to fields in many of the areas served by Natomas Mutual without additional pumping. RD 1000 owns the second type of canal system, which consists of drainage canals that Natomas Mutual uses during the irrigation season to distribute water to areas not served directly by highline canals. Because the drainage canals are set at elevations below that of the adjoining fields, the water must be relifted by pumping into a highline canal or directly onto fields. Since all fields within the service area drain to these drainage canals, Natomas Mutual is able to recapture and re-circulate tailwater⁶ from agricultural fields for irrigation purposes. Therefore, Natomas Mutual either supplies river water to the drainage canals to meet demands or, when there is excess tailwater, reduces diversions and increases recirculation back into the highline canal system.

While the area serviced by Natomas Mutual is relatively flat, the system canals are able to utilize gravity flow with approximately 1 to 3 feet of fall per 10,000 linear feet of canal. As a result, velocities in the canal system are slow (less than 3 feet per second) even during peak flow conditions. Given the size and hydraulic complexity of Natomas Mutual's canal system, the range of flows at different points within the distribution system varies from 0 to 3 feet per second depending upon where water is being delivered.

Natomas Mutual currently distributes water through five primary irrigation systems that are linked and used to support each other (see **Figure 2-2**). Each irrigation system is served by a pumping facility located either along the Sacramento River or the NCC. These systems are described below.

NORTHERN SYSTEM

The Northern System provides service to over 12,500 acres in the northeast portion of the Natomas Mutual service area. The system is served by the Northern Pumping Plant, which is

⁶ Tailwater is water that has drained off of agricultural fields and is collected by the drainage canal system.

situated along the south bank of the NCC, approximately 2.5 miles upstream of its confluence with the Sacramento River. The Northern Main Canal connects to the Northern Pumping Plant to provide irrigation service to the area.

The Northern Pumping Plant consists of five vertical lift pumps with a total capacity of 250 cfs, with average monthly diversions between 7,400 and 10,400 acre-feet⁷. Over 100 cfs of the plant supply can be rerouted from the Northern Main Canal to the North Drainage Canal via the T Drain as required to regulate levels within the drainage canal system during the irrigation season.

BENNETT SYSTEM

The Bennett System provides service to nearly 5,700 acres in the northwest portion of the Natomas Mutual service area. The system is served by the Bennett Pumping Plant, which is situated along the south bank of the NCC approximately 1.2 miles upstream of its confluence with the Sacramento River. The Bennett Main Canal connects to the Bennett Pumping Plant to provide irrigation service to the area.

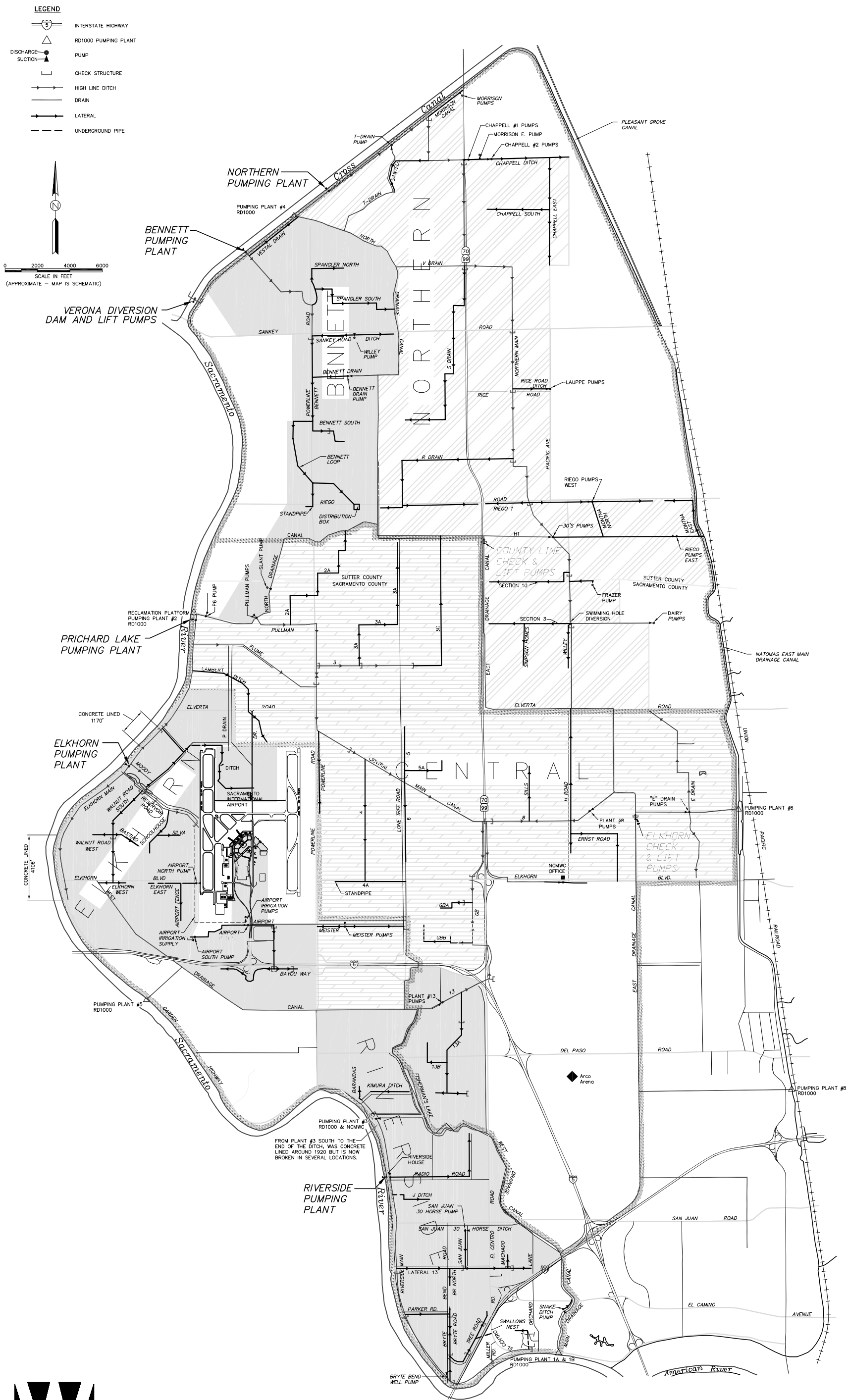
The Bennett Pumping Plant consists of three vertical lift pumps with a total capacity of over 125 cfs, with average monthly diversions between 3,500 and 4,700 acre-feet. Over 40 cfs of the plant supply can be rerouted to the North Drainage Canal via the Vestal Drain as required to regulate levels within the drainage canal system during the irrigation season.

CENTRAL SYSTEM

The Central System provides service to nearly 7,700 acres in the central portion of the Natomas Mutual service area. The system is served by the Prichard Pumping Plant, which is situated along the east bank of the Sacramento River at approximately River Mile (RM) 75.1. The Central Main Canal connects to the Prichard Pumping Plant to provide irrigation service to the area.

The Prichard Pumping Plant consists of three vertical lift pumps, with a total capacity of 150 cfs, with average monthly diversions between 1,400 and 3,100 acre-feet. To regulate levels within the drainage canal system during the irrigation season, over 50 cfs of excess water supply can be routed from the plant to the North Drainage Canal.

⁷ From May to August, 10-year average.



ELKHORN SYSTEM

The Elkhorn System provides service to over 2,800 acres in the western portion of the Natomas Mutual service area. The system is served by the Elkhorn Pumping Plant, which is situated along the east bank of the Sacramento River at approximately RM 73.3. A series of canals connected to the Elkhorn Pumping Plant provides irrigation service to the area.

The Elkhorn Pumping Plant consists of two vertical lift pumps with a total capacity of 60 cfs, with average monthly diversions between 1,400 to 1,900 acre-feet. A 0.75-acre reservoir receives water from the pumping plant and is used for water storage and sediment control. Gravity provides water to the service area through a series of canals stemming from the reservoir. To supplement levels in the drainage canal system, water can be supplied to the West Drainage Canal at the south end of the Elkhorn Main Canal and the east end of Reservoir Road.

RIVERSIDE SYSTEM

The Riverside System provides service to over 2,700 acres in the southwestern portion of the Natomas Mutual service area. The system is served by the Riverside Pumping Plant, which is situated along the east bank of the Sacramento River at approximately RM 65.4. The Riverside Main Canal connects to the Riverside Pumping Plant to provide irrigation service to the area.

The Riverside Pumping Plant consists of two inclined lift pumps with a total capacity of approximately 45 cfs, with average monthly diversions between 1,000 and 1,500 acre-feet. The Riverside Main Canal parallels the Garden Highway and provides gravity service from the Riverside Pumping Plant to a system of laterals. To supplement levels in the drainage canal system, water can be supplied to the West Drainage Canal through laterals off of the Riverside Main Canal. Tailwater within the drainage system is reused in the Riverside System using RD 1000's Pumping Plant No. 3 and numerous other drainage water recirculation facilities.

DRAINAGE CANAL SYSTEM

RD 1000's main drainage canals in the basin include the North, East, and West drainage canals. In addition to the five primary irrigation systems described above, the RD 1000 drainage canal system also distributes water throughout the service area. Under a joint operations agreement with RD 1000, Natomas Mutual regulates levels within the drainage canal system during the irrigation season to facilitate distribution of irrigation water throughout the basin. Internal lift stations, operated by Natomas Mutual and other private landowners, are located throughout the service area to re-lift water from the drainage canals to the highline canals or provide water directly to the fields. Primary facilities used in the distribution and recirculation of irrigation water are shown in **Figure 2-2**. The river pumping plants, as described in the preceding sections,

in combination with the tailwater that drains off the irrigated fields, supply water to the drainage canal systems. By utilizing the drainage system, Natomas Mutual recirculates approximately 30,000 acre-feet of water per year.

Water flows naturally from the northern portion of the Natomas Basin to the southern portion of the basin through these main drainage canals. To maintain the drain levels required for deliveries, operators must balance inflows to match outflows. Adjustments are made by regulating the supply from river diversions in response to changes in drain levels. For irrigation deliveries, drain levels are maintained at the highest level practical without impacting proper drainage from adjacent fields. The drainage canal system is separated into three reaches by two control structures: the County Line Check and Lift Pumps, and the Elkhorn Check and Lift Pump. These reaches are operated at different levels to maintain the required levels for water deliveries. These control structures also enable the regulation of water levels by providing the ability to spill water between reaches and recirculate water between reaches by pumping.

Since the main drainage canals are sized for conveyance of much higher flows that normally occur during winter storms, the velocities during the irrigation season are low (less than 2 feet per second). Water levels in the drainage canals can fluctuate as much as 3 feet over the irrigation season and as much as one foot per day, depending on the quantity of tailwater runoff entering the drains and the demand for irrigation water from the drains.

During the irrigation season, the rate and direction of flow within the drainage canal system is varied to meet demands. At the start of the irrigation season, available water is supplied from each of Natomas Mutual's river pumping plants to the drainage canal system. Water supply inflow into the system is at its maximum at this time (drain levels are drawn down during the winter months for RD 1000's flood control operations). Approximately 140 cfs can be routed into the Northern Drainage Canal from the Northern and Bennett systems and approximately 50 cfs can be routed into the North Drainage Canal from the Central System. During this time many of the re-lift pumping plants throughout the basin are withdrawing water from the drains, and tailwater entering the drain is typically limited. Therefore, the water being supplied to the drains at each of the five Natomas Mutual diversions is being used at the nearest re-lift pumping plants (the points of supply and locations of re-lift pumping plants are shown in **Figure 2-2**).

Once crops are established, and normal drain operating levels have been restored, supply inflows are reduced. During the active growing season, small adjustments are generally made over time in response to the amount of tailwater entering the system and crop demands. As described in the preceding paragraphs, water is typically regulated at the County Line and Elkhorn checks to move water to suit demands.

At the end of the irrigation season (and during summer rainfall events), the fields are draining, leading to high inflows into the drainage system. Supply from the river is curtailed and all of the recirculation facilities are operated at their peak capacities. Drain levels are at their highest during this period. When drain levels continue to rise to the point where there is potential for flooding the adjacent fields, and all of the irrigation demand is being met, RD 1000 turns on its drainage pumping plants to pump excess water out of the basin to the Sacramento River or NCC.

VERONA DAM DIVERSION AND LIFT PUMPS

The Verona Dam and lift pumps are located in the NCC, approximately 0.2 mile upstream from its confluence with the Sacramento River. This facility is utilized during periods of low flow on the Sacramento River—on average three out of every 10 years for two to four months at a time. The facility consists of three removable steel bulkheads and five diesel lift pumps. The bulkheads and pump motors are installed when low water levels in the NCC create problems with the operation of the Bennett and Northern pumping plants. This facility then pumps water from the Sacramento River into the NCC, maintaining water levels sufficient to operate the Bennett and Northern pumping plants. During times of high water and at the end of the irrigation season, the bulkheads and diesel motors are removed.

2.3 PROJECT ALTERNATIVES

This section begins by describing the process followed in developing the ABFS Proposed Action and alternatives to this action. It then describes in detail each of the four alternatives selected for analysis in this EIS/EIR.

2.3.1 PROJECT FORMULATION

The California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) require that environmental documents identify and analyze a reasonable range of feasible alternatives. Under CEQA and NEPA, the range of potential alternatives to the proposed project/proposed action should include those that could feasibly accomplish most of the basic purpose and need, and objectives of the project proponent. In addition, CEQA requires that alternatives be designed to avoid or substantially lessen one or more of the significant effects anticipated to be associated with the proposed action. NEPA and CEQA also require that a No Action/No Project Alternative be analyzed.

Reclamation and California Department of Fish and Game (CDFG) developed the alternatives to be analyzed within this EIS/EIR with input from the California Department of Water Resources (DWR), National Marine Fisheries Service (NMFS), and the United States Fish and Wildlife Service (USFWS). Reclamation and CDFG also held public scoping meetings to solicit

additional screening alternatives (see Chapter 5). The purpose and need statement (Section 1.4) and the project objectives description (Section 1.5) formed the basis for the development and evaluation of alternatives under NEPA and CEQA. This section summarizes the process used by the agencies to define the alternatives subject to detailed analysis in this EIS/EIR.

Natomas Mutual and its consultants prepared a Feasibility Study Technical Report for this project in October 2000 (Ensign & Buckley 2000). In coordination with the Anadromous Fish Screen Program Technical Team, three project design alternatives out of the six that were analyzed were identified as feasible and selected for evaluation through the environmental analysis. In addition to the No Action/No Project Alternative, the following three alternatives were selected:

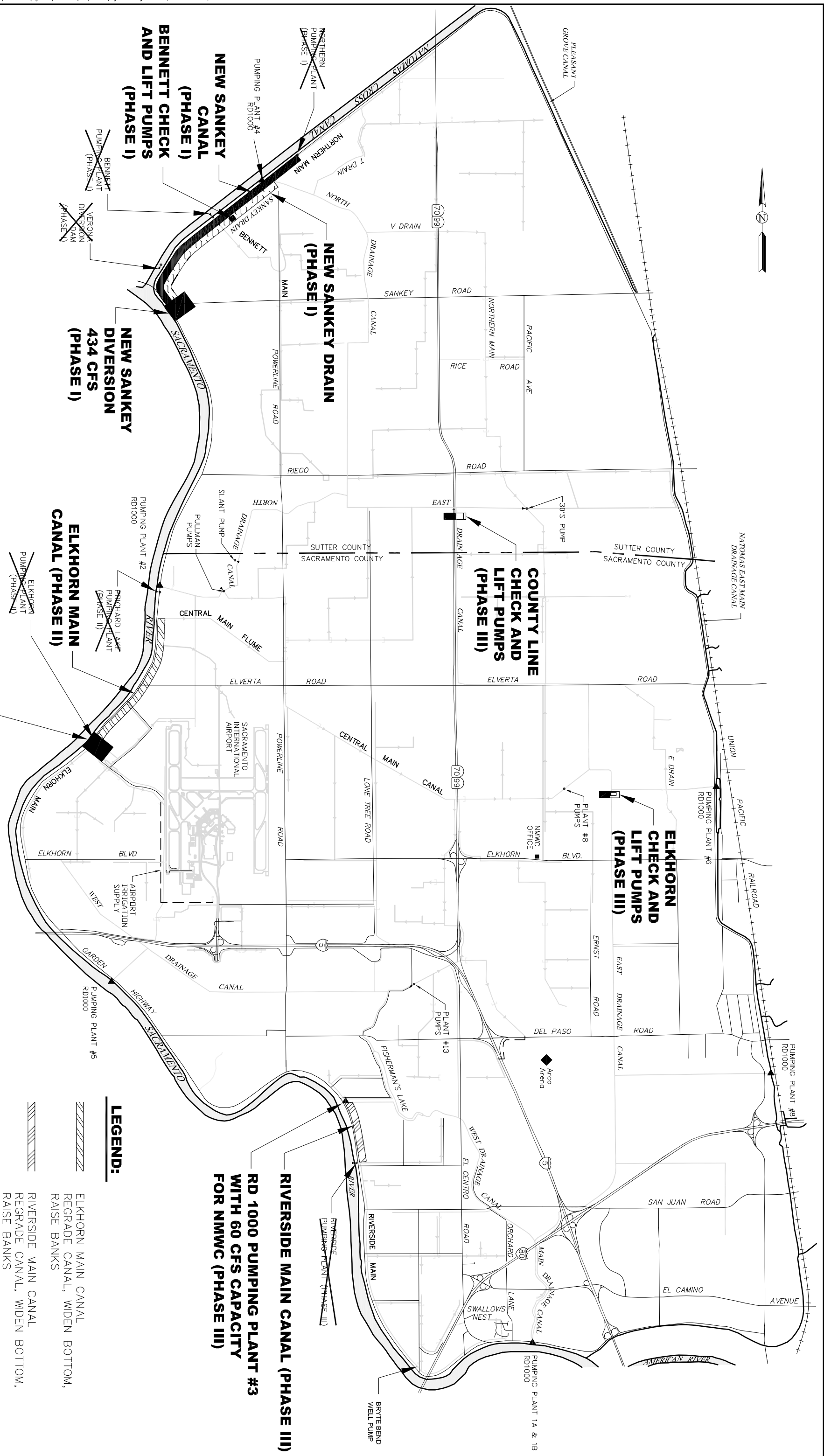
- Sankey/Elkhorn Diversions (**Figure 2-3**)
- Sankey Diversion (**Figure 2-4**)
- Prichard Diversion (**Figure 2-5**)

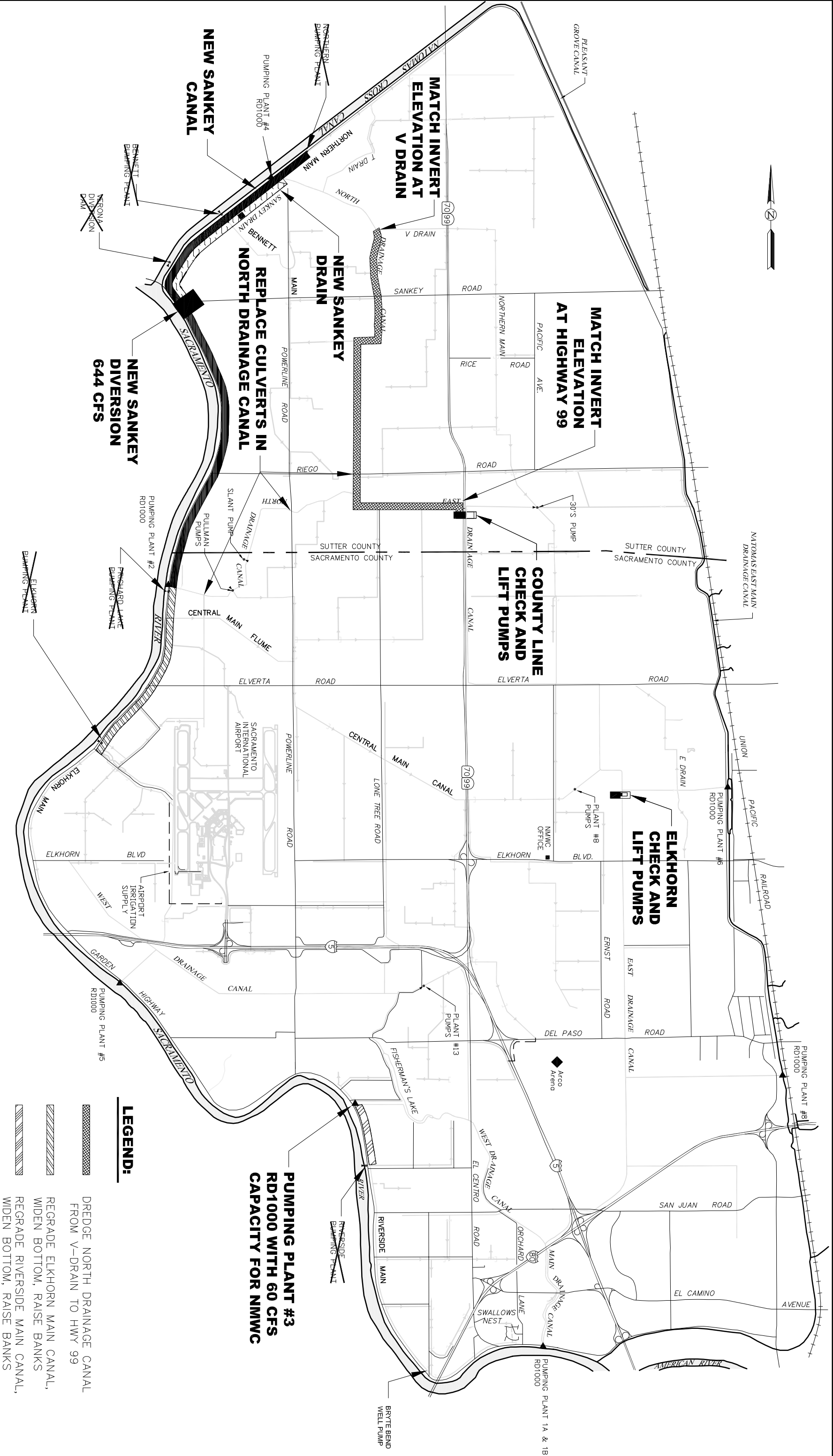
The Sankey/Elkhorn Diversions alternative is Natomas Mutual's proposed project/proposed action and hereinafter will be referred to as the ABFS Proposed Action. Section 2.3.6 presents the alternatives considered but eliminated from detailed analysis, along with the reasons why the alternatives were eliminated.

COMMON COMPONENTS OF ALL ACTION ALTERNATIVES

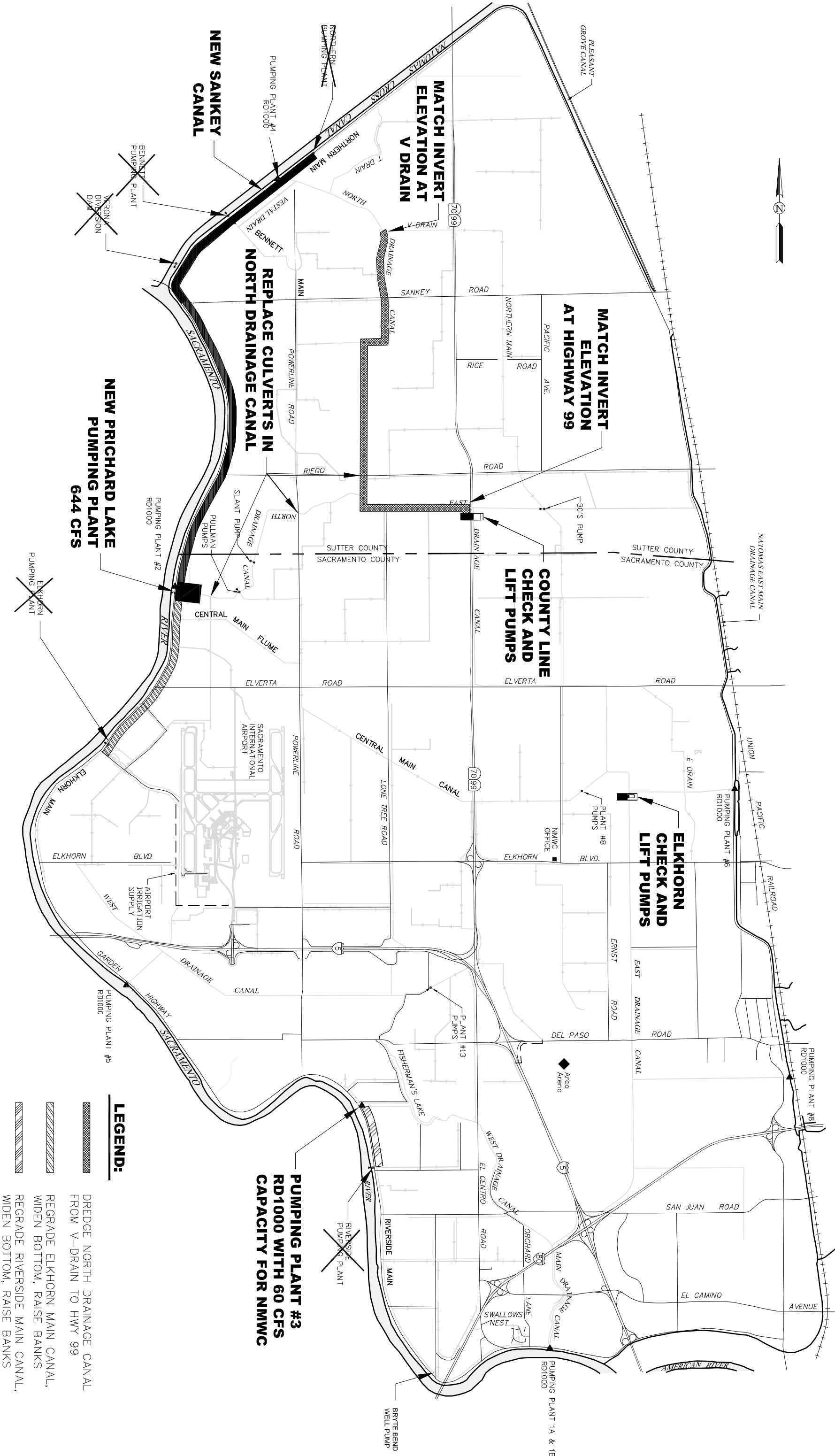
All of the action alternatives of the ABFS project entail the following improvements to Natomas Mutual facilities:

- Removing the existing Verona Dam and diesel pumps from the NCC.
- Removing the five pumping plants (two along the NCC and three along the Sacramento River).





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	AMERICAN BASIN FISH SCREEN AND HABITAT IMPROVEMENT PROJECT		
OCTOBER 2007 SUBMITTED	APPROVED	FIGURE 2-4	



MEAD HUNT ENGINEERS ARCHITECTS SCIENTISTS PLANNERS 3327 Longview Drive Sacramento, California 95821 Phone: (916) 971-5961 Fax: (916) 971-6578		NATOMAS MUTUAL WATER COMPANY	
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FIGURE 2-5

- Removing one privately owned pump for the Bolen Ranch property adjacent to the Sankey Diversion (nine other small unscreened pumps within the Natomas Basin, owned and operated by other landowners for irrigation purposes, are not part of the project and would remain operational).
- Constructing one or two new diversion facilities with fish screens, to replace the water supply provided by the pumping plants being removed.
- Modifying the distribution system to convey surface water supply from the new diversion locations to the points of service at the existing pumping plant outfalls (maintaining existing flow rates, levels and scheduling), including re-grading of existing canals, the construction of a new highline canal, and modifications to drainage canals.

The characteristics of each alternative are discussed below.

2.3.2 NO ACTION/NO PROJECT ALTERNATIVE

The No Action/No Project Alternative describes a projection of existing conditions to future conditions without the ABFS Proposed Action. It is analyzed to provide a baseline for the comparative evaluation of the action alternatives, as required by NEPA and CEQA. Under the No Action/No Project Alternative, the following would occur:

- The five pumping plants (two along the NCC and three along the Sacramento River) would remain in operation. The intakes associated with these pumping plants would continue to remain unscreened.
- The Bolen Ranch private intake and pump would remain unscreened.
- The existing Verona Dam and diesel pumps would continue to provide water to the two pumping plants along the NCC during periods of low flow.
- No modifications would occur to the existing distribution system.

The unscreened diversions would continue to operate under the existing conditions previously described. Continued operation of the unscreened diversions would risk potential entrainment of listed and non-listed native fishes.

Some land development may occur in the future within the Natomas Mutual service area and water needs in those areas may change from agricultural irrigation to M&I uses. Should development occur, the developed areas would be served by the City of Sacramento, Sutter County, or by Natomas Mutual. The nature, specific location, and timing for any development

would be determined through the land use process and would be driven by regional economics. Future development would require land use approvals from Sutter County, Sacramento County, or the City of Sacramento and would be subject to environmental analysis consistent with CEQA. Furthermore, any change in surface water use from agricultural to municipal and industrial uses would require approval from the SWRCB and the California Public Utilities Commission, which would also require subsequent environmental analyses. Just like future land use impacts are speculative, any decrease in surface water demand from future development is also speculative. Future development could be delayed due to regional and national economic conditions. Crop patterns could shift, creating high demand for water on fewer irrigated acres. The effects of potential future changes in land use in the ABFS Action Area are assessed in Section 4.1: *Cumulative Impacts*.

2.3.3 ABFS PROPOSED ACTION

INTRODUCTION

The ABFS Proposed Action would replace the five existing unscreened diversion facilities with two new screened diversions. The ABFS Proposed Action would be implemented in three phases. Phase I would include the construction of the Sankey Diversion, the Sankey Canal and Sankey Drain, and associated improvements. Phase II includes the construction of the Elkhorn Diversion and the Elkhorn Main Canal. Phase III includes re-grading the Riverside Main Canal and making associated improvements to the internal conveyance system as required to route flows from the Sankey Diversion. The unscreened and screened diversions for each phase are summarized in **Table 2-1** following the descriptions of each phase.

Phase I of the ABFS Proposed Action has independent utility and would be constructed first. Phases II and III would only be constructed if adequate funding were to become available. Phase II has independent utility and could be constructed prior to Phase I, though it is of lower priority to the state and federal resources agencies. Phase III does not have independent utility and would only be constructed after Phase I is completed to provide the water supply. Phase III could be implemented prior to Phase II. Due to the uncertainty of whether Phase I construction would be followed by Phases II and III, mitigation measures have been identified for significant impacts for each phase of the ABFS Proposed Action. Consequently, each phase will trigger specific requirements under NEPA and CEA to address impacts associated with that phase. **Throughout this EIS/EIR, the ABFS Proposed Action refers to all three phases unless otherwise stated.**

PHASE I - SANKEY DIVERSION

Phase I of the ABFS Proposed Action consists of constructing one new 434 cfs diversion (420 cfs for Natomas Mutual, and 14 cfs for a private diverter) on the Sacramento River, equipped with a state-of-the-art fish screen that complies with NMFS and CDFG salmonid screening criteria. The Sankey Diversion would be located near Sankey Road, approximately 0.25 mile downstream of the confluence of the Sacramento River with the NCC (just downstream of the existing marina at Verona Village [see **Figure 2-3**]). Under Phase I of the ABFS Proposed Action, the following changes would be implemented:

- Construct the new Sankey Diversion facility equipped with a state-of-the-art fish screen as described above.
- Construct the new Sankey Canal along the landside of the NCC south levee from the existing Northern Pumping Plant outfall to the new Sankey Diversion, with a connection to the existing Bennett Main Canal at the Bennett Pumping Plant outfall, including a new turnout (outlet) for replacement of the supply to the Bolen Ranch property.
- Construct the Sankey Drain adjacent to the new Sankey Canal from the North Drainage Canal at RD 1000's Pumping Plant No. 4 (Pumping Plant No. 4) to the new Sankey Diversion, including a re-lift pumping plant near the Bennett outfall for recirculation of tailwater into the Northern and Bennett systems. Flows from the existing Vestal Drain would be incorporated into the new Sankey Drain, which will be wider and longer than the existing Vestal Drain.
- Decommission and remove the existing Verona Diversion Dam and Lift Pumps.
- Decommission and remove two existing Natomas Mutual diversions at the Northern and Bennett pumping plants, and the small privately-owned pump for the Bolen Ranch property.
- Create refugia benches to improve giant garter snake habitat in those sections of the new Sankey Canal between Pumping Plant No. 4 and the new Sankey Diversion that are on land owned by TNBC. By agreement with Natomas Mutual (Roberts pers.comm.), the benches would be maintained by TNBC to optimize conditions for the federally and state threatened giant garter snake (*Thamnophis gigas*). Natomas Mutual would have an easement for maintaining water conveyance through the new canal for agricultural deliveries.

Limits will be designed into the system to control pumping beyond existing capacity until the Elkhorn (Phase II) and Riverside work (Phase III) is constructed and implemented. Thus, the total existing diversion capacity of 630 cfs would be maintained with the new Sankey Diversion

and the existing diversions at Elkhorn, Prichard, and Riverside, which would continue to operate without fish screens during this phase.

PHASE II - ELKHORN DIVERSION

Phase II of the ABFS Proposed Action consists of constructing one new 210 cfs diversion on the Sacramento River, equipped with a state-of-the-art fish screen, that complies with NMFS and CDFG salmonid screening criteria. The new Elkhorn Diversion would be located between Elkhorn and Elverta roads (adjacent to and just downstream of the existing Elkhorn Pumping Plant [see **Figure 2-3**]). Under Phase II of the ABFS Proposed Action, the following changes would be implemented:

- Construct a new diversion facility equipped with a state-of-the-art fish screen as described above.
- Re-grade the Elkhorn Main Canal between the existing Prichard Pumping Plant and the new Elkhorn Diversion.
- Decommission and remove the two existing Natomas Mutual diversions at the Prichard and Elkhorn pumping plants.

The Elkhorn Diversion capacity matches the capacity of the Prichard and Elkhorn pumping plants. Thus, the total existing diversion capacity of 630 cfs would be maintained. Implementation would eliminate unscreened diversions at the subject pumping plants only.

PHASE III – INTERNAL CONVEYANCE UPGRADES

Phase III of the ABFS Proposed Action consists of re-grading the Riverside Main Canal and making associated improvements to the internal conveyance system [see **Figure 2-3**]). Under Phase III, the following changes would be implemented:

- Re-grade the Riverside Main Canal from the existing Riverside Pumping Plant outfall to Pumping Plant No. 3 and add one re-lift pump to the existing Pumping Plant No. 3 sump for replacement of the Riverside Pumping Plant supply.
- Improve the internal drainage canal system, including upgrading two control structures, the County Line Check and Lift Pump and the Elkhorn Check and Lift Pumps.
- Decommission and remove the existing Riverside Pumping Plant. The existing capacity of 45 cfs would be served by the new Sankey Diversion constructed in Phase I. Implement operating system upgrades at the Sankey Diversion as required to allow for diversion of the Riverside system flows at this site.

- Create refugia benches to improve giant garter snake habitat in the new Riverside Main Canal from Pumping Plant No. 3 to the existing Riverside Pumping Plant.

Following Phase III, no unscreened diversions would remain operational within the ABFS Proposed Action Area. **Table 2-1** summarizes the status of each diversion facility at the end of each phase of the ABFS Proposed Action.

Table 2-1 Natomas Mutual Operating Screened and Unscreened Diversions by ABFS Proposed Action Phase

	Unscreened Diversions					Screened Diversions		
	Northern	Bennett	Prichard	Elkhorn	Riverside	Bolen	Sankey	Elkhorn
Existing	250 cfs	125 cfs	150 cfs	60 cfs	45 cfs	14 cfs		
Following Phase I			150 cfs	60 cfs	45 cfs		389 cfs ^a	
Following Phase II					45 cfs		389 cfs ^a	210 cfs
Following Phase III							434 cfs ^b	210 cfs

a Includes 375 cfs for Natomas Mutual and 14 cfs for Bolen Ranch. This diversion facility will be built with a capacity of 434 cfs, but will be operated at 389 cfs until the Riverside Diversion is decommissioned under Phase III.

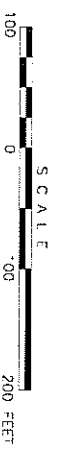
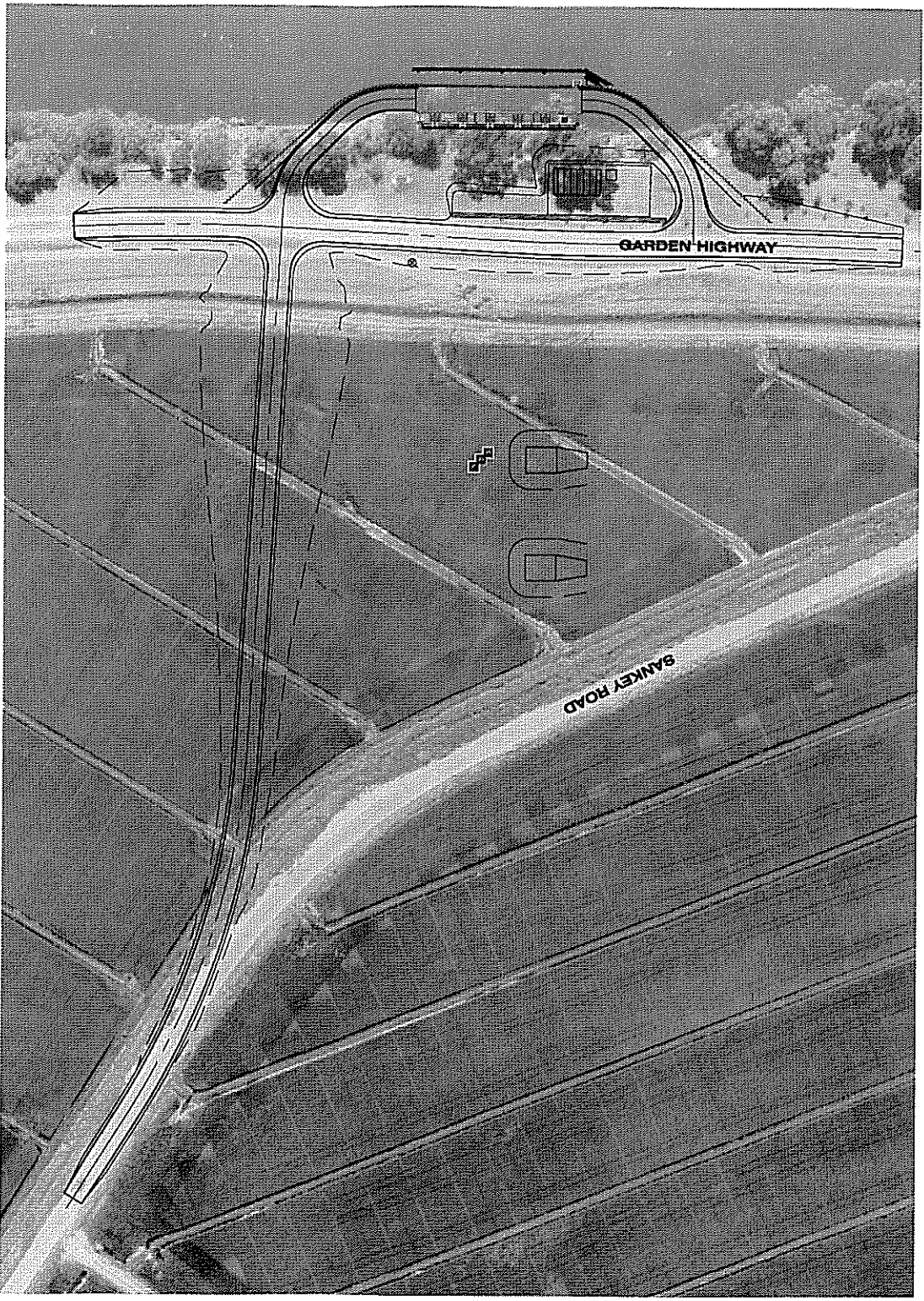
b 420 cfs for Natomas Mutual and 14 cfs for Bolen Ranch.

The following sections describe characteristics, construction methods, and proposed operations for all of the facilities listed above.

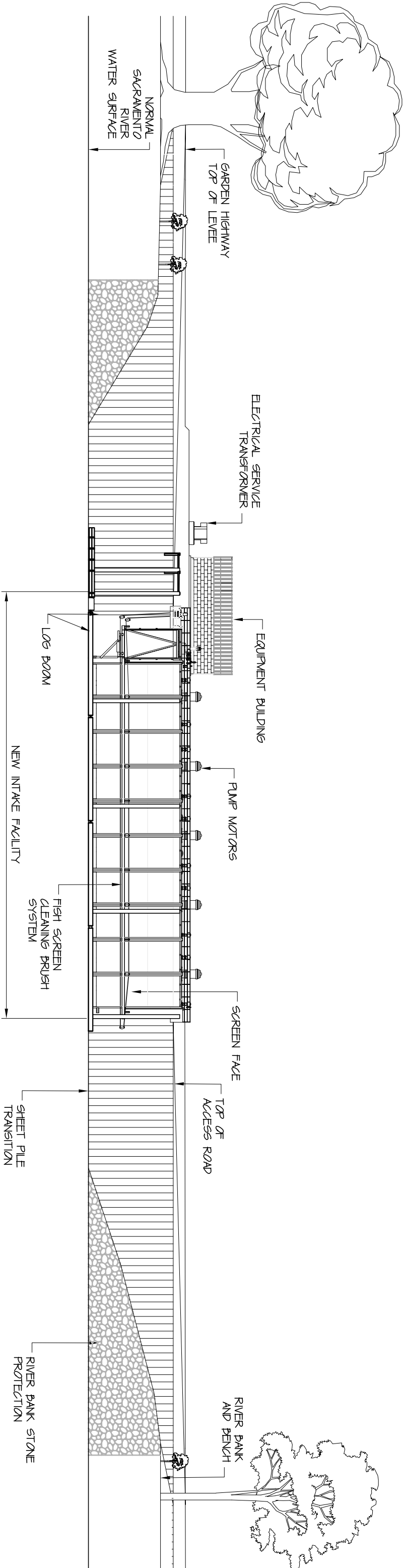
FACILITY CHARACTERISTICS

Sankey Diversion (Phase I)

The new Sankey Diversion would be a 434 cfs capacity pumping plant (at normal operating levels) equipped with a state-of-the-art fish screen system which complies with NMFS and CDFG salmonid screening criteria. The facility would be located on the left (east) bank of the Sacramento River, approximately 1/4 mile downstream of the confluence with the NCC. The intake facility would divert water from the Sacramento River and lift the supply into the Sankey Canal and the Sankey Drain (described in the following section). The proposed Site Plan, Typical Front Elevation, and Typical Profile are shown in **Figures 2-6 through 2-8**.

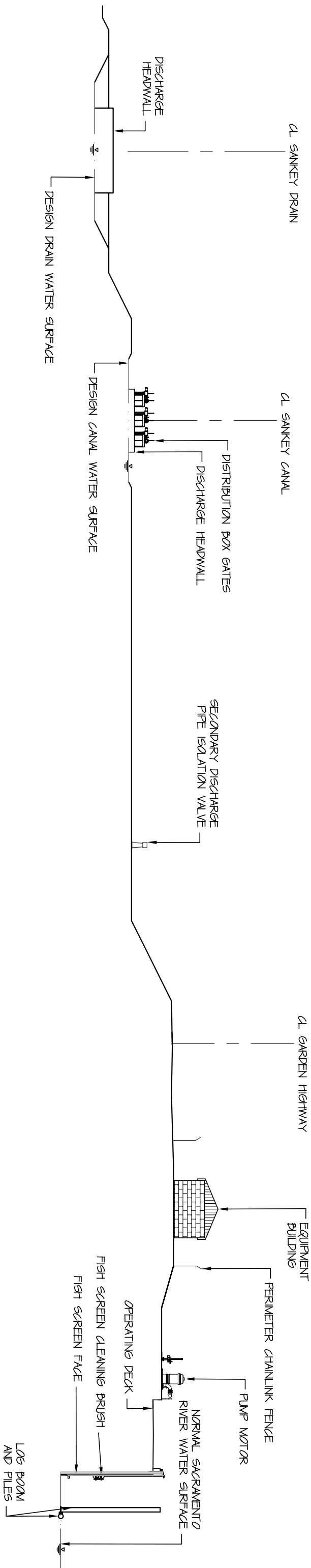


MEAD & MUNT ENGINEERS 3521 Laguna Oaks, Sacramento, California 95821 Phone: (916) 771-0401 Fax: (916) 771-0295		NATOMAS MUTUAL WATER COMPANY AMERICAN BASIN FISH SCREEN AND HABITAT IMPROVEMENT PROJECT ABFS PROPOSED ACTION - PHASE I SANKEY DIVERSION - SITE PLAN	
SUBMITTED OCTOBER 2007	APPROVED SRS	SCALE OF ORIGINAL 1"=100'	
		FIGURE 2-6	




ELEVATION VIEW – LOOKING EAST FROM RIVER

<div><div><div>MEAD & HUNT</div><div>ENGINEERS ARCHITECTS SCIENTISTS PLANNERS</div></div><div>3327 Longview Drive Sacramento, California 95821 Phone: (916) 971-5961 Fax: (916) 971-6578</div></div>		NATOMAS MUTUAL WATER COMPANY		SCALE OF ORIGINAL: NOT TO SCALE	
OCTOBER 2007		APPROVED		AMERICAN BASIN FISH SCREEN AND HABITAT IMPROVEMENT PROJECT ABFS PROPOSED ACTION – PHASE I SANKY DIVERSION – ELEVATION VIEW	
SUBMITTED				FIGURE 2-7	



CROSS SECTION – LOOKING DOWNSTREAM

 <p>3321 Longview Drive, Sacramento, California 95821 Phone: (916) 971-3961 Fax: (916) 971-4578</p>	<p>ENGINEERS</p> <p>ARCHITECTS</p> <p>SCIENTISTS</p> <p>PLANNERS</p>	<p>NATOMAS MUTUAL WATER COMPANY</p>		<p>SCALE OF ORIGINAL: NOT TO SCALE</p>
	<p>AMERICAN BASIN FISH SCREEN AND HABITAT IMPROVEMENT PROJECT</p> <p>ABFS PROPOSED ACTION – PHASE I</p> <p>SANKEY DIVERSION – PROFILE</p>	<p>FIGURE 2-8</p>		

The facility would have five identical vertical lift pumps, with two pumps designated only for discharges into the Sankey Canal and three pumps designed to switch between discharging into the Sankey Canal and Sankey Drain, depending upon the amount and locations of irrigation demands. Pumps would be capable of automatic operation using variable frequency drives to adjust pump output for regulation of supply to the Sankey Canal and Sankey Drain to suit demands. The discharge pipes would be raised as they pass through the levee with the bottom of the pipes above the 100-year flood level for flood control purposes. The pipes would also have valves on the waterside to close them off in the event of a flood. Flow measurement devices would be installed at the pumping plant outlet for documenting the volume of water diverted.

The Sankey Diversion intake would be equipped with a positive barrier fish screen. The screen face would be vertically oriented with a length of 150 feet⁸. The intake facility would have five pump bays and one bay for a blowout panel that would trip in case of a screen blockage. Each pump bay would have four screen panels. The 13-foot high fish screen panels would rest on a sill at approximately Elevation -4.5⁹. Solid steel panels would be used to complete the screen face up to operating deck level. Screen material would be stainless steel wedge wire with 1.75 millimeters (0.0689-inch) wide openings and with a minimum open area of 40 percent. Screen area would be sized for a maximum approach velocity of 0.33 foot-per-second and an adjustable porosity control system would be included behind the screen face to provide for uniform flow distribution.

Screen facilities would be equipped with automatic cleaning and sediment control systems to prevent accumulation of debris and sediment that could impede the screen's flow area and affect the screen system hydraulics. The screen face would be aligned with the bank, parallel to stream flow, with the screen face flush with the face of the structure to allow for unimpeded fish movement parallel to the screen face. The configuration of the intake works was developed to limit the potential for any undesirable hydraulic effects that may impede fish movement or provide increased opportunities for predatory fish species.

The water delivery system, sediment control, and screen cleaning systems would be capable of automatic or manual control. A radio system would be used to remotely monitor the facility from Natomas Mutual headquarters. Water surface elevations would be monitored in front of and behind the screens, as well as in the Sankey Canal and Sankey Drain. Flows would be monitored by flow measurement devices. Total electrical load would be less than 3,000 KVIA and would be provided for via a new 480-volt, 3-phase, 4-wire service from PG&E. The new

⁸ Length includes bay for one blowout panel on the upstream end.

⁹ All elevations are based upon mean sea level datum.

service would be obtained from the existing PG&E overhead transmission line on the east side of the Garden Highway.

The intake invert would be at approximately Elevation -5.0. The screen face operating deck would be placed above the 100-year flood elevation at approximately Elevation 38.6 and the motor deck would be a minimum of 3 feet above the 100-year level. The base of the intake structure would be approximately 160 feet long by 50 feet wide. A 5-foot concrete sill in front of the facility would aid in sediment control. The intake facility foundation would be enclosed in a sheet pile shell and supported by evenly spaced H piling.

The screen face would be offset approximately 80 feet from the top of the river bank¹⁰. To protect the screen from damage, a log boom, floating on vertical piling, would be placed approximately 10 feet in front of the screen face. The upstream and downstream intake transitions from the screen face to river channel bank would be created with curved steel sheet pile walls. The channel bank would be armored with rock lining within the transition area, for no more than 125 linear feet on the upstream end and 165 linear feet on the downstream end, as measured along the bank line. The sheet piling would be extended to the levee toe to protect the access roads.

Two paved access roads would be constructed from the Garden Highway. Access roads would tee off of the Garden Highway approximately 200 feet upstream and downstream of the facility centerline. The equipment building and storage yard would be located within the footprint of the facility, off the Garden Highway shoulder.

To accommodate facility construction, the Garden Highway would be raised and the Sankey Road intersection would be relocated. Road improvements would be based upon Sutter County standards with a minimum design speed of 45 miles per hour. The Garden Highway would be raised to the minimum planned top of levee elevation within the footprint of the facility¹¹ to provide minimum cover over the top of the facility's discharge pipes. The levee embankment would be built-up on both sides to provide for a road section that matches the existing Garden Highway alignment.

With transitions, the embankment raising would extend no more than 450 feet upstream and downstream of the facility (see **Figure 2-6** for approximate footprint). To avoid the Sankey Diversion outfall and improve the intersection with the Garden Highway, Sankey Road would be realigned to form a "T" intersection with the Garden Highway as shown in **Figure 2-6**. This

¹⁰ As measured from the bench level at approximate Elevation 34.5.

¹¹ Between facility access road intersections.

realignment would begin approximately 200 feet east of the existing curve and would join the Garden Highway directly across from the existing south access road.

The pumping plant outfall would be set off of the levee toe as required to align centerlines of the Sankey Canal and Sankey Drain. The discharge pipe outfalls would be constructed of cast-in-place concrete and designed to transition to canal sections. The canal section would be lined with rock for no more than 50 feet downstream of the outfall. Further details for the Sankey Canal and Drain are provided below.

The new Sankey Diversion would be sited on a portion of three parcels of land, two of which are privately owned. The third is owned by the State of California, Sutter County APN 35-001-020. Right-of-ways for the facility construction would be obtained from the two private landowners, and approvals for the use of the state land would be obtained from the State Lands Commission and the State Reclamation Board. A portion of the existing property is currently set aside for use as landscape irrigation for the treated water from the Verona Village sewage treatment system, in accordance with California Regional Water Quality Control Board (RWQCB) Order No. 97-10-DWQ-R5034. An alternative disposal area for this water, with a 30-day average flow not exceeding 7,200 gallons per day, would be incorporated into the project footprint, either through irrigation of landscaping or mitigation areas. Disposal area details would be implemented in accordance with applicable regulations and authorized by an amended Order from the RWQCB.

Sankey Canal and Drain (Phase I)

The Sankey Canal and Sankey Drain are new irrigation supply ditches that would connect the new Sankey Diversion with the existing Natomas Mutual distribution system. The 12,900-linear-foot (LF) Sankey Canal would convey water at the required rate and level to replace the supply to the Northern Main Canal and the Bennett Main Canal currently provided by the Northern and Bennett pumping plants. The canal would have a peak capacity of 250 cfs for the 5,900 LF reach between the Northern and Bennett systems, and a peak capacity of 350 cfs for the 7,000 LF reach between the Bennett and the new Sankey Diversion. The adjacent 10,000 LF Sankey Drain would convey up to 210 cfs for 10,000 LF from the Sankey Diversion to the North Main Drainage Canal at Pumping Plant No. 4 to replace the supply for internal irrigation re-lift pumps. As described in the preceding section, the Sankey Diversion would have several dual-use pumps capable of pumping to either the highline canal or drain to stage the peak flow rates between the canal and drain depending upon demand.

Typical canal sections for various reaches are shown in **Figure 2-9**. The canal would be unlined, with earthen embankments, and the drain would be an unlined excavated ditch. The Sankey Canal embankments would provide one foot of freeboard¹² at design capacity. To match the water surfaces elevations (WSEL) at the existing Northern and Bennett pumping plant outfalls at the design flows with a fall of no more than 1.5 feet in 10,000 LF, the design WSEL at the Sankey Diversion outfall would be 29.5 feet. The Sankey Drain would be designed to deliver peak capacity at the normal WSEL in the North Drainage Canal at Pumping Plant No. 4 with a WSEL at least 2 feet below the surrounding field level. This would result in a design WSEL at the Sankey Diversion of 18.0 feet.

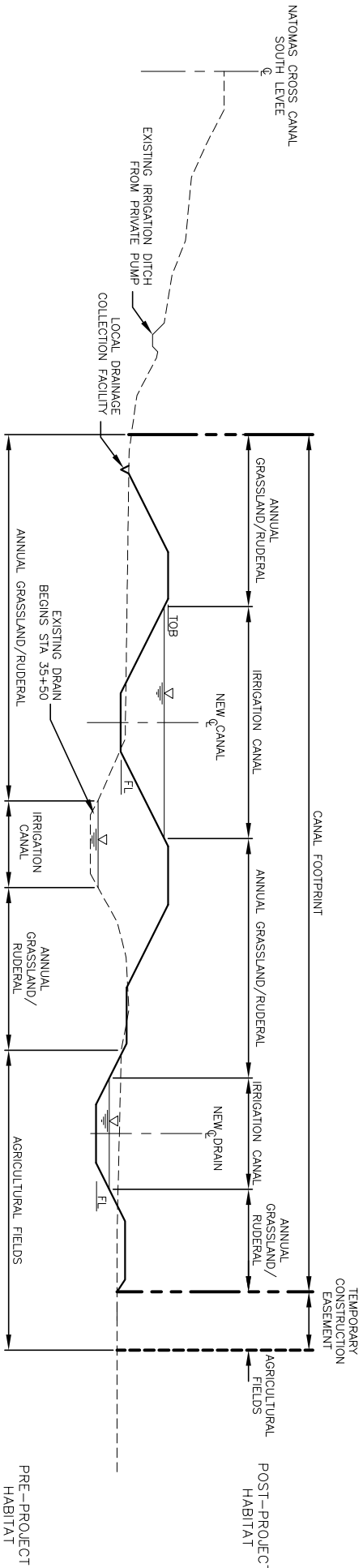
The canal reach through TNBC property east of Pumping Plant No. 4 would be constructed with a shallow flooded bench on the field side to provide potential refugia¹³ and basking habitat for the giant garter snake. The field side embankment in this reach would be maintained by TNBC along with the adjacent conservation habitat. The footprint for the total cross section would be no more than 220 feet between the Sankey Diversion and Bennett Main Canal, 210 feet between the Bennett Main Canal and Pumping Plant No. 4, and 140 feet between Pumping Plant No. 4 and the Northern Main Canal.

The drainage from the levee side would be collected in a toe ditch and piped to the Sankey Drain through culverts under the Sankey Canal. Adjacent fields would be drained into the Sankey Drain by restoring existing field drain pipes.

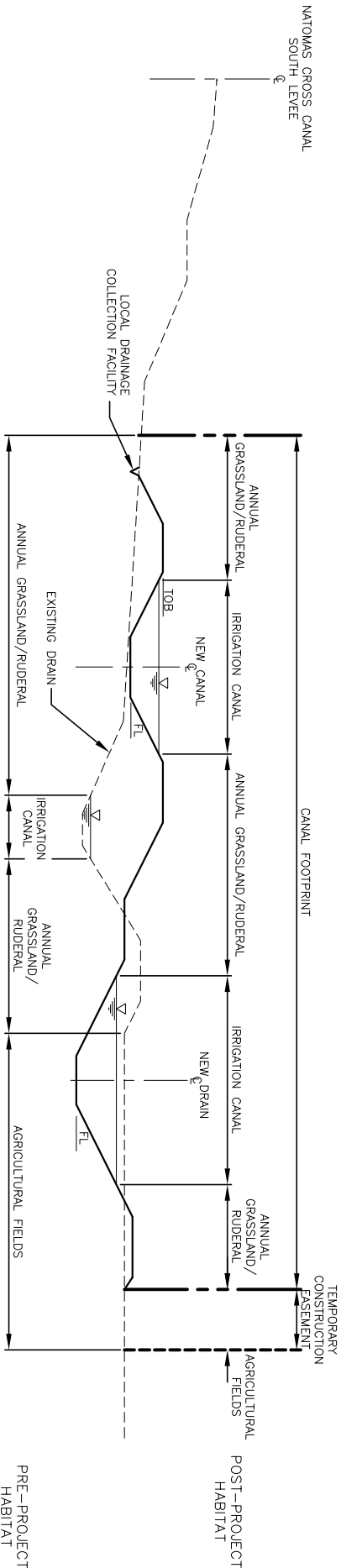
The existing Vestal Drain would be incorporated into the Sankey Drain, thereby, setting the required invert elevation at the intersection with the existing Vestal Drain. Since the Bolen Ranch diversion pump is being incorporated into the Sankey Diversion, the existing irrigation ditch for the Bolen Ranch, which runs along the toe of the Garden Highway levee, would be incorporated into the Sankey Canal, and a new irrigation turnout would be provided to supply water to the ranch.

¹² Distance from operating water surface to top of bank.

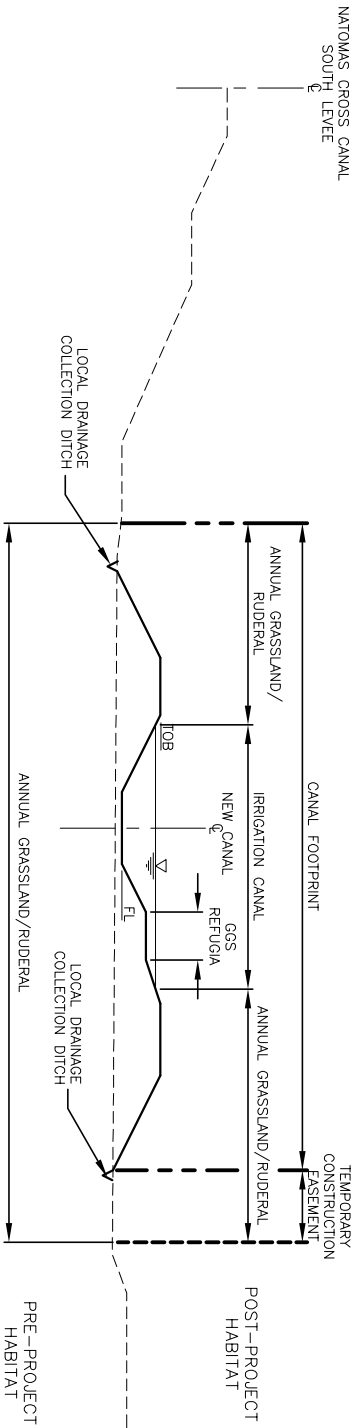
¹³ Refugia habitat is that portion of an animal's normal home range that can be used to escape predation or other dangers.




TYPICAL CROSS SECTION
NEW SANKY DIVERSION TO BENNETT PUMPING PLANT



TYPICAL CROSS SECTION
BENNETT PUMPING PLANT TO RD 1000 PUMPING PLANT NO. 4



TYPICAL CROSS SECTION
RD 1000 PUMPING PLANT NO. 4 TO NORTHERN PUMPING PLANT

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OCTOBER 2007		AMERICAN BASIN FISH SCREEN AND HABITAT IMPROVEMENT PROJECT	
SUBMITTED		ABFS PROPOSED ACTION – PHASE I SANKY CANAL TYPICAL SECTIONS	
OCTOBER 2007		SRS	
SUBMITTED		APPROVED	
FIGURE 2-9		VERIFY SCALES BAR IS TWO INCHES ON ORIGINAL DRAWING, ADJUST SCALES FOR REDUCED PLOTS 0 1 2"	

To regulate the flow between the Bennett and Northern systems, a check structure would be provided in the Sankey Canal downstream of the Bennett Canal intersection and another check structure would be added in the Bennett Canal downstream of the intersection. These checks would be automated to maintain downstream water levels to suit demands. To restore tailwater re-circulation capacity, a new lift pump station would be provided to lift water from the Sankey Drain (from the North Drainage Canal source) into the Sankey Canal, upstream of the Bennett Check. The Bennett Re-lift Pumping Plant would have three pumps with a total capacity of 120 cfs and slots for the addition of two new pumps. Capabilities would be provided for Natomas Mutual to monitor canal and drain levels, as well as the operation of gates and lift pumps, from their headquarters.

The outfall for the new Sankey Drain into the North Drainage Canal would replace the existing Vestal Drain outlet pipe with a new double 6- by 5-foot box culvert. The Sankey Canal would be piped over the North Drainage Canal in front (south) of Plant 4. The canal section under the pipe crossing would be lined with concrete or rock which would extend approximately 10 feet upstream and downstream of the crossing.

Natomas Mutual only has easements for a portion of the proposed footprint of the Sankey Canal and Sankey Drain. Additional rights-of-way would be obtained from two private landowners. The facilities would also be situated on properties owned by RD 1000 and TNBC under existing access agreements. Some exchange of easements with the Sacramento Area Flood Control Agency (SAFCA) and PG&E would also be required.

With the exception of the reaches of the Vestal Drain incorporated into the Sankey Drain and the Bolen Ranch irrigation ditch incorporated into the Sankey Canal, the Sankey Canal and Sankey Drain would be new water conveyance facilities. The new ditches would be constructed in maintained annual grassland areas and agricultural fields. The Northern and Bennett main irrigation canals would be temporarily disturbed during the interconnection with the new system. A limited reach of the North Drainage Canal immediately south of Pumping Plant 4 would be temporarily disturbed during the construction of the Sankey Drain outfall and the Sankey Canal pipe crossing, and a limited reach would be permanently lined under the pipe crossing. Specific features could be added to the new canals to enhance the habitat for giant garter snakes by providing additional refugia or hibernacula features (e.g., broken slabs of concrete covered with earth). Such features would be designed in consultation with the appropriate resource and regulatory agencies.

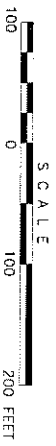
Elkhorn Diversion (Phase II)

The new Elkhorn Diversion would be a 210 cfs capacity pumping plant (at normal operating levels) with a state-of-the-art fish screen system. The facility would be located on the left (east) bank of the Sacramento River, approximately 0.9 mile downstream of Elverta Road, adjacent to and downstream of the existing Elkhorn Pumping Plant. The diversion and outfall would be sited on property owned by Natomas Mutual. The intake facility would divert water from the Sacramento River and lift the supply into the Elkhorn Main Canal (described in the following section). The proposed Site Plan, Typical Front Elevation, and Typical Profile are shown in **Figures 2-10 through 2-12**.

The facility would have four identical submersible lift pumps, discharging into the Elkhorn Main Canal system at flows and levels to meet demands. Pumps would be capable of automatic operation using variable frequency drives to adjust the pump motor speed as required to maintain set water levels in the Elkhorn Main Canal to meet demands. The discharge pipes would be raised as they pass through the levee with the bottom of pipes above the 100-year flood level for flood control purposes. The pipes would also have valves on the waterside to allow the pipes to be closed off in the event of a flood. Flow measurement devices would be installed at the pumping plant outlet for documenting the volume of water diverted.

The Elkhorn Diversion intake would be equipped with a positive barrier fish screen, which complies with NMFS and CDFG salmonid screening criteria. The Elkhorn Diversion screen face would be inclined on a slope of 1.5 horizontal to 1 vertical foot, due to low river depth, and would be 83.5 feet long. The intake facility would have four pump bays. The front face of the intake would be concrete with openings for screen panels. The top of screen panels would be just below Elevation 7.5, with the bottom of the screen at Elevation 0.0. Screen material would be stainless steel wedge wire with 1.75 millimeter (0.0689 inch) wide openings and a minimum open area of 40 percent. Screen area would be sized for a maximum approach velocity of 0.33 foot per second and an adjustable porosity control system would be included behind the screen face to provide for uniform flow distribution.

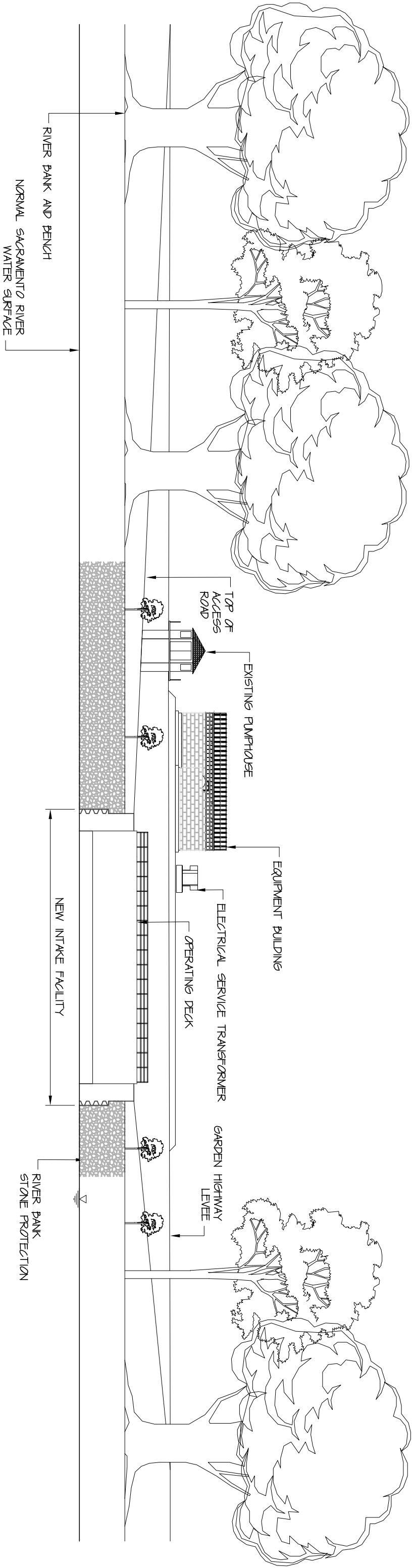
Screen facilities would be equipped with automatic cleaning and sediment control systems to prevent accumulation of debris and sediment that could impede the screen's flow area and affect the screen system hydraulics. The screen face would be aligned with the bank, parallel to stream flow, with the screen face flush with the face of the structure to allow for unimpeded fish movement parallel to screen face. The configuration of the intake works was developed to limit the potential for any undesirable hydraulic effects that may impede fish movement or provide increased opportunities for predators.



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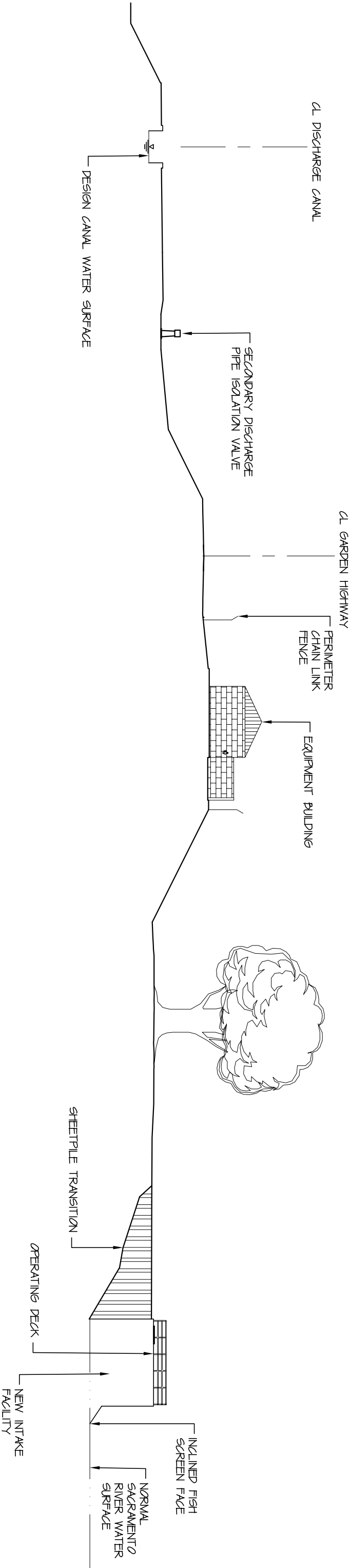
NATOMAS MUTUAL WATER COMPANY
 AMERICAN BASIN FISH SCREEN AND HABITAT IMPROVEMENT PROJECT
 ABFS PROPOSED ACTION - PHASE II
 ELKHORN DIVERSION - SITE PLAN

SCALE OF ORIGINAL
 1"=100'
 FIGURE 2-10



ELEVATION VIEW – LOOKING SOUTHEAST FROM RIVER

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OCTOBER 2007 SUBMITTED		SRS APPROVED	
AMERICAN BASIN FISH SCREEN AND HABITAT IMPROVEMENT PROJECT ABFS PROPOSED ACTION – PHASE II ELKHORN DIVERSION – ELEVATION VIEW		SCALE OF ORIGINAL: NOT TO SCALE	
		FIGURE 2-11	



CROSS SECTION – LOOKING DOWNSTREAM

<div><div><div>MEAD</div><div>HUNT</div></div><div>ENGINEERS ARCHITECTS SCIENTISTS PLANNERS</div></div> <div>3327 Longview Drive Sacramento, California 95821 Phone: (916) 971-5961 Fax: (916) 971-4678</div>		<div>NATOMAS MUTUAL WATER COMPANY</div> <div>AMERICAN BASIN FISH SCREEN AND HABITAT IMPROVEMENT PROJECT ABFS PROPOSED ACTION – PHASE II ELKHORN DIVERSION – PROFILE</div>		<div>SCALE OF ORIGINAL: NOT TO SCALE</div> <div>FIGURE 2-12</div>	
<div>OCTOBER 2007</div> <div>SUBMITTED</div>		<div>SRS</div> <div>APPROVED</div>			

The water delivery system, sediment control, and screen cleaning systems would be capable of automatic or manual control. A radio system would be used to allow Natomas Mutual to remotely monitor the facility from their headquarters. Water surface elevations would be monitored in front of and behind the screens, as well as in the Elkhorn Main Canal north and south of the outfall. Flows would be monitored by flow measurement devices. Total electrical load would be less than 1,500 KVIA and would be provided via a new 480-volt, 3-phase, 4-wire service from SMUD. The new service would be obtained from the existing SMUD overhead transmission line on the east side of the Garden Highway.

The intake invert would be at approximate Elevation -3.75. The area in front of the screen would have a 5-foot wide sill at Elevation -1.25 for sediment management and stability. The inclined face of the intake would extend from the sill to Elevation 13.75, with a vertical wall then extending up to the intake operating deck at Elevation 28.4. The operating deck would be at the existing bench¹⁴ level, which is more than 10 feet below the 100-year water surface elevation and, therefore, would be completely submerged at high river levels.

The base of the intake structure would be approximately 85 feet long by 50 feet wide. The intake facility foundation would be enclosed in a sheet pile shell and supported by H piling.

The screen face would be offset approximately 100 feet from the top of the riverbank. The intake upstream and downstream intake transitions to river channel bank would be created with steel sheet pile walls. The channel bank would be armored with rock lining within the transition area, for no more than 80 feet beyond the upstream and downstream ends, as measured along the bank lines.

Two paved access roads would be constructed to the screen operating deck from the Garden Highway. Access roads would tee off of the Garden Highway approximately 200 feet upstream and downstream of the facility centerline. The equipment building and storage yard would be located, within the footprint of the facility, on a pad constructed off the shoulder of the Garden Highway at the level of the highway. To accommodate facility construction, the Garden Highway would be raised. Road improvements would be based upon Sacramento County standards with a minimum design speed of 45 miles per hour.

The Garden Highway would be raised to the minimum planned top of levee elevation within the footprint of the facility to provide minimum cover over the top of the facility's discharge pipes. The levee embankment would be built up on both sides to provide for a road section that matches the existing Garden Highway alignment. With transitions, the embankment raising would extend

¹⁴ The ground level between the top of river channel bank and toe of levee.

no more than 200 feet downstream and 350 feet upstream of the facility (see **Figure 2-10** for approximate footprint).

The pumping plant outfall would be set off of the levee toe as required to align with the existing Elkhorn Main Canal. The discharge pipe outfall would be constructed of cast-in-place concrete and designed to transition to canal sections. The canal section would be lined with rock for no more than 25 feet downstream of the outfall. Further detail for the Elkhorn Main Canal is provided below.

Elkhorn Main Canal (Phase II)

The Elkhorn Main Canal would be an improved reach of the existing main irrigation canal along the toe of the Garden Highway, between the Elkhorn and Prichard pumping plants, to connect the new Elkhorn Diversion with the existing Natomas Mutual distribution system. Improvements would be configured to convey water from the new Elkhorn Diversion at the rate and level necessary to replace the existing supply. Approximately 8,600 LF of the existing main irrigation canal would be widened and raised from the Central Main Flume¹⁵ to the Elkhorn Pumping Plant outfall. To meet conveyance needs, the water surface level at the Central Main Flume take-out would match existing water surface levels. To maintain the existing supply to the North Drainage Canal, water from the new Elkhorn Diversion would be conveyed all the way to the existing Prichard Pumping Plant outfall; however, no improvements are necessary beyond the intersection with the Central Main Flume.

All existing lateral irrigation canals and piped turnouts supplied off of the main canal between the Central Main Flume and the Elkhorn Diversion outfall would be restored. Peak design capacity varies within this reach of canal as water is turned out to supply adjacent fields and lateral irrigation canals. To match existing demands, the canal would be sized for a peak capacity of 145 cfs for the 1,600 LF reach between the Central Main Flume and the Lambert Ditch lateral, 160 cfs for the 2,600 LF reach between the Lambert Ditch lateral and Elverta Road, and 170 cfs for the 4,400 LF reach between Elverta Road and the Elkhorn Diversion. The system would also have capacity to push water up river past the Central Main Flume to maintain the existing turnouts to intermediate fields and the North Drainage Canal; however, existing conveyance capacity in this reach is adequate without the need for improvement.

¹⁵ The Central Main flume is a lateral canal which takes off of the main canal about 1,800 LF south of the existing Prichard Pumping Plant outfall.

Typical canal sections for various reaches are shown in **Figure 2-13**. The canal would be unlined, with earthen embankments. The Elkhorn Main Canal embankments would provide 1-foot of freeboard at design capacity. To match the WSEL at the existing Central Main Flume takeout at design flow, with a fall of no more than 1.5 feet in 10,000 LF, the design WSEL at the Elkhorn Diversion outfall would be 29.0 feet. The footprint for the total cross section would be no more than 100 feet.

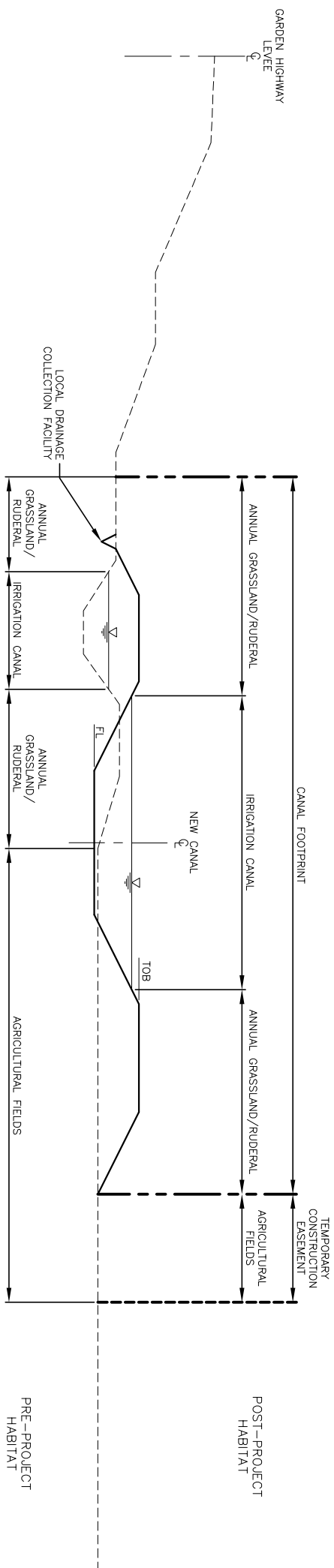
To provide for the increased conveyance capacity, the culverts for existing driveway crossings and Elverta Road would be upsized to double 5- by 6-foot concrete boxes. Existing irrigation turnouts, which are pipes through the field-side canal embankment with inlet gates for flow regulation, would be restored. Other irrigation and drainage facilities within the existing or new canal footprint, (e.g., buried irrigation pipes, an irrigation well and drainage recirculation facilities) would be restored or avoided. Drainage from the levee side would be collected in a toe ditch and piped to existing drainage ditches, or recirculated back into the highline canal. The SMUD pole line, which runs along the field side of the canal, would be relocated landward to accommodate the canal construction.

Natomas Mutual only has easements for a portion of the proposed canal footprint. Additional rights-of-way would be obtained from two private landowners and the County of Sacramento. RD 1000 and SMUD would be required to exchange easements.

The existing irrigation canal would be incorporated into the new Elkhorn Main Canal. The widened canal footprint would be constructed in maintained disturbed uplands and agricultural fields. Scattered clusters of trees would also be displaced by the canal footprint.

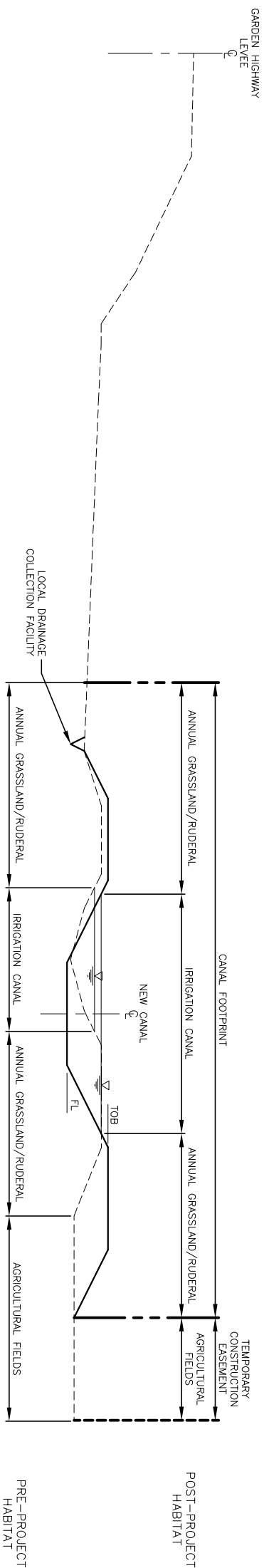
Pumping Plant No. 3 and Riverside Main Canal (Phase III)

To replace the supply from the Riverside Pumping Plant, water from the West Drainage Canal would be re-lifted at Pumping Plant No. 3 and returned to the Riverside outfall through the Riverside Main Canal. Additional re-lift capacity would be added at Pumping Plant No. 3, control structures would be provided at the Pumping Plant No. 3 outfall, and the Riverside Main Canal would be improved to convey water at the rate and level needed to replace the existing supply.



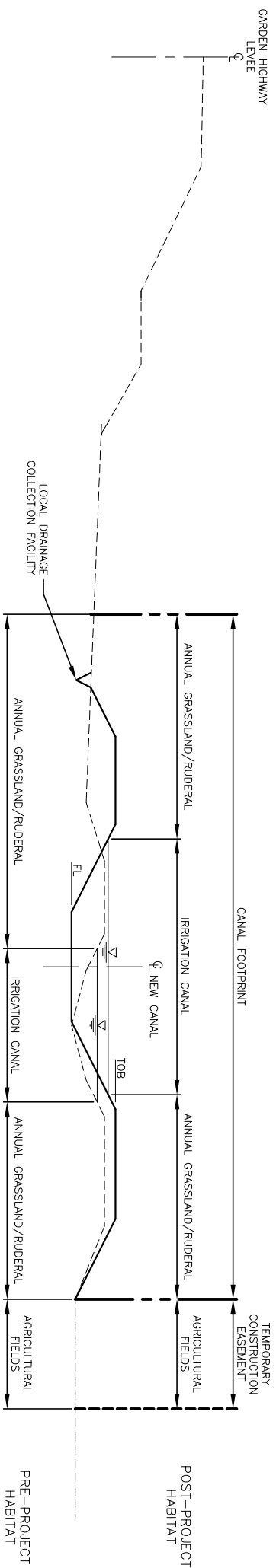
TYPICAL CROSS SECTION

ELKHORN DIVERSION TO LAMBERT DITCH





TYPICAL CROSS SECTION

LAMBERT DITCH TO APN 201-0140-064



TYPICAL CROSS SECTION
APN 201-0140-064

NOTE: SCATTERED AREAS OF OAK WOODLAND EXIST ALONG THE CANAL, BUT ARE NOT TYPICAL. SEE ELKHORN CANAL AERIAL FIGURES

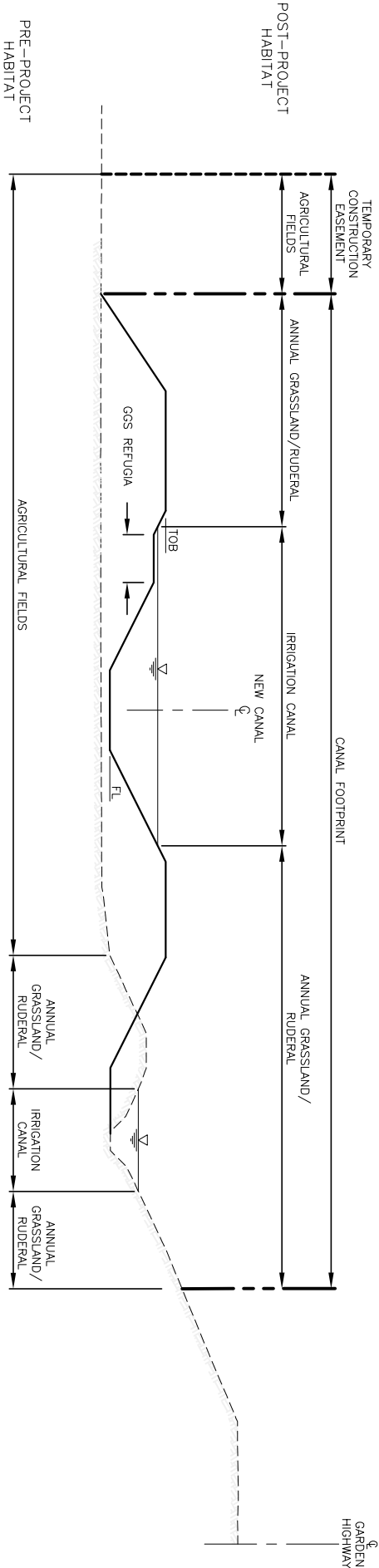
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3323 Longview Drive Sacramento, California 95821 Phone: (916) 971-3861 Fax: (916) 971-4578		AMERICAN BASIN FISH SCREEN AND HABITAT IMPROVEMENT PROJECT ABFS PROPOSED ACTION – PHASE II ELKHORN CANAL TYPICAL SECTIONS	
OCTOBER 2007 SUBMITTED	SRS APPROVED	VERIFY SCALES BAR IS ONE INCH ON ORIGINAL DRAWING. ADJUST SCALES FOR REDUCED PLOTS. 	
		FIGURE 2-13	

A total of 58 cfs re-lift capacity would be provided at Pumping Plant No. 3 to replace the existing Riverside Pumping Plant supply (45 cfs) and maintain service for existing demand at Pumping Plant No. 3 (13 cfs). The existing 9,000-gallon-per-minute (gpm) pump at Pumping Plant No. 3 would remain and a new pump would be installed in an existing opening in the pump sump. The existing concrete sump configuration would allow for the addition of the new pump without modification. The discharge pipes for both pumps would be rerouted to a new outfall to be constructed in the improved Riverside Main Canal. Pumps would be capable of being automatically operated using variable frequency drives to adjust the pump motor speed as required to maintain set water levels in the Riverside Main Canal to meet demands.

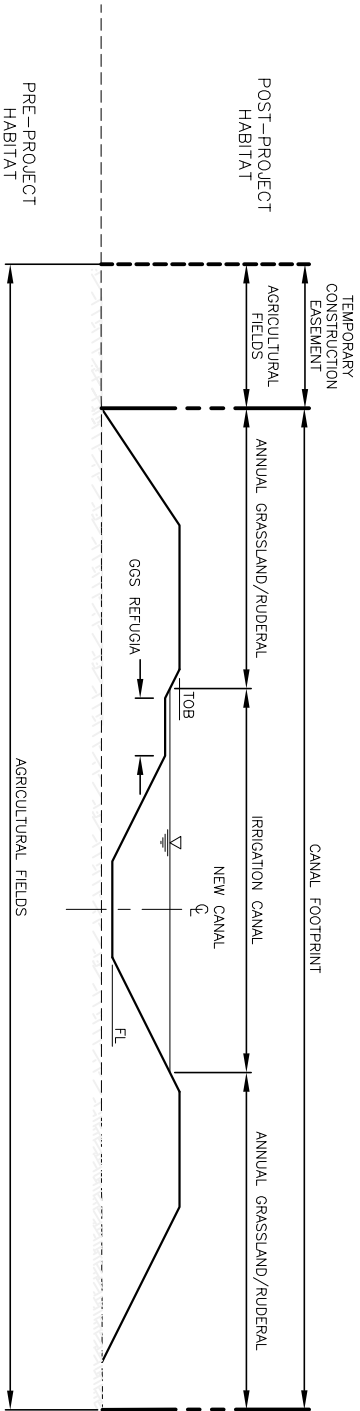
The water delivery system would be capable of automatic or manual control and a radio system would allow Natomas Mutual to remotely monitor the facility from their headquarters. The electrical service would be upgraded to meet the added capacity. No conveyance improvements would be required in the drainage canal leading to Pumping Plant No. 3, as the system capacity is already sized for the substantially higher drainage flows handled by RD 1000.

The Riverside Main Canal work would involve the improvement of a reach of the existing main irrigation canal along the toe of Garden Highway, between the existing Riverside Pumping Plant outfall and Pumping Plant No. 3. Approximately 4,000 LF of the existing main irrigation canal would be widened and raised, as required to match existing WSEL and peak flow rates at the Riverside Pumping Plant outfall. Typical canal sections for various reaches are shown in **Figure 2-14**. The canal would be unlined, with earthen embankments. The Riverside Main Canal embankments would provide one foot of freeboard at design capacity. The canal would be sized for 50 cfs peak conveyance capacity to replace existing Riverside Pumping Plant demands (45 cfs) and maintain existing service in this reach (5 cfs). To match the WSEL at the existing Riverside Pumping Plant outfall, at design flow, with a fall of no more than 1.0 foot in 10,000 LF, the design WSEL at the Pumping Plant No. 3 would be 28.0 feet. The canal reach through TNBC property south of Pumping Plant No. 3 would be constructed with a shallow flooded bench on the field side to provide potential refugia and basking habitat for the giant garter snakes. The footprint for the total cross section would be no more than 120 feet.

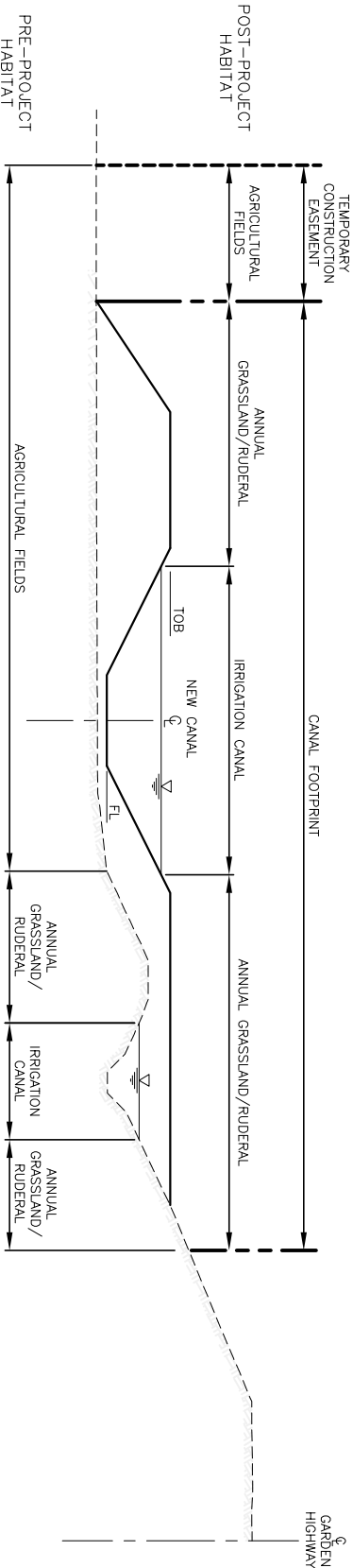
To provide for the increased conveyance capacity, the culverts for existing driveway crossings would be upsized to double 4- by 4-foot concrete boxes. Existing irrigation turnouts, which are pipes through the field-side canal embankment with inlet gates for flow regulation, would be restored.






TYPICAL CROSS SECTION
STA 1+00 TO 9+00



TYPICAL CROSS SECTION
STA 9+00 TO 20+00



TYPICAL CROSS SECTION
STA 20+00 TO 39+50

<div><div><div>MEAD & HUNT</div><div>ENGINEERS ARCHITECTS PLANNERS</div><div>3337 Longview Drive Sacramento, California 95821</div><div>Phone (916) 971-5961 Fax (916) 971-4575</div></div><div><div>OCTOBER 2007</div><div>SRS</div></div><div><div>SUBMITTED</div><div>APPROVED</div></div></div> <tr><td colspan="2">NATOMAS MUTUAL WATER COMPANY</td></tr> <tr><td colspan="2">AMERICAN BASIN FISH SCREEN AND HABITAT IMPROVEMENT PROJECT</td></tr> <tr><td colspan="2">ABFS PROPOSED ACTION – PHASE III</td></tr> <tr><td colspan="2">RIVERSIDE CANAL TYPICAL SECTIONS</td></tr> <tr><td colspan="2">VERIFY SCALES BAR IS ONE INCH ON ORIGINAL DRAWING. ADJUST SCALES FOR REDUCED PLOTS 1"</td></tr> <tr><td colspan="2">FIGURE 2-14</td></tr>		NATOMAS MUTUAL WATER COMPANY		AMERICAN BASIN FISH SCREEN AND HABITAT IMPROVEMENT PROJECT		ABFS PROPOSED ACTION – PHASE III		RIVERSIDE CANAL TYPICAL SECTIONS		VERIFY SCALES BAR IS ONE INCH ON ORIGINAL DRAWING. ADJUST SCALES FOR REDUCED PLOTS  1"		FIGURE 2-14	
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FIGURE 2-14													

Natomas Mutual only has easements for a portion of the proposed facility footprint. Additional right-of-way would be obtained from two private landowners. The facilities would also be situated on property owned by TNBC under existing access agreements and some exchange of easements with RD 1000 would also be required.

The existing irrigation canal would be incorporated into the new Riverside Main Canal. The widened canal footprint would be constructed in disturbed uplands and agricultural fields. The canal would be rerouted around a cluster of trees to avoid the need for their removal. Specific features could be added to the new canal habitat to enhance the habitat for the giant garter snakes by providing additional refugia or hibernacula features. Such features would be designed in consultation with the appropriate resource and regulatory agencies.

Internal Drainage Canal Distribution System (Phase III)

Improvements to the internal drainage canal system would be made to provide for control and conveyance of water from the consolidated diversions to the points of usage¹⁶. The features include:

- Improvements to the County Line Check and Lift Pumps to replace gates for additional conveyance and control, add electric operators, and provide for remote monitoring.
- Reconstruction of the Elkhorn Check and Lift Pumps to increase spill capacity, add gates for automation, and provide for remote monitoring.
- Addition of water level gaging stations for the North Drainage Canal at Riego Road and the East Drainage Canal at Del Paso Road for remote monitoring of water levels.

At the existing County Line Check, the gates mounted on the upstream headwall for the twin 7-by 7-foot box culverts are undersized and would be replaced with full size gates with solar powered operators. The gates would be automated and equipment would be added for remote monitoring. The work would be performed within the existing facility footprint.

¹⁶ Primary points of supply to the drainage canal system would be at Pumping Plant No. 4 from the Sankey Diversion and at RD 1000's Pumping Plant No. 2 from the Elkhorn System, while additional demands for water from the drainage system would exist at Pumping Plant No. 3. Supply flows would therefore be routed through the County Line and Elkhorn Checks. The proposed improvements would provide for increased conveyance needs and more accurate control to mitigate for the impacts to response time that would occur as a result of moving supplies further from demands.

The existing Elkhorn Check and Lift Pump Facility would be reconstructed as shown in **Figure 2-15**. The existing cast-in-place concrete check structure would be replaced with a new similarly configured facility. The new check would have three 10-foot bays with an automatic weir gate in the center bay and two stoplog bays on each side. The existing lift pumps would be moved into new concrete sumps, which would be incorporated into the check structure to minimize the facility footprint (existing pumps are on a pile supported platform downstream of the check structure).

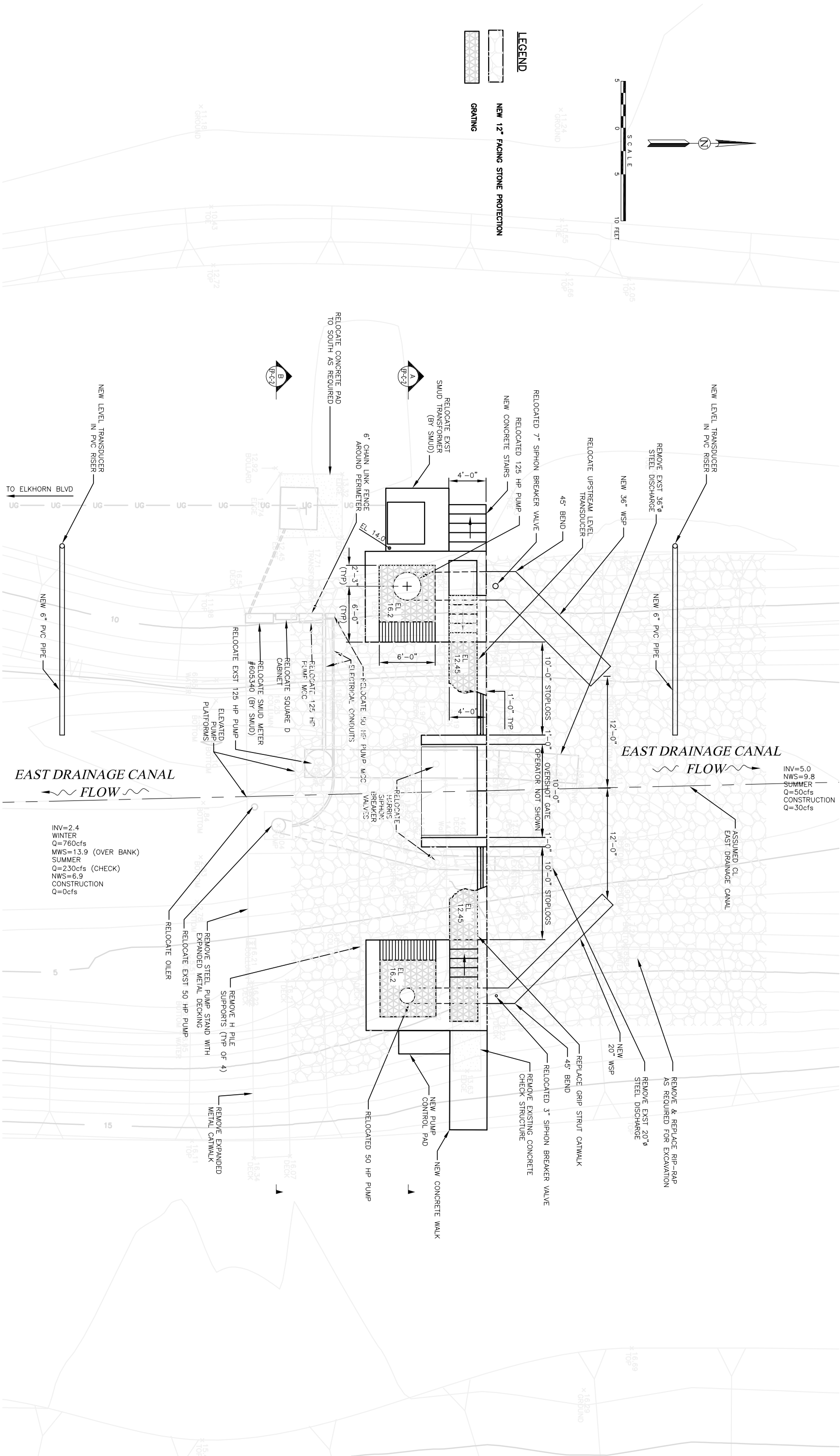
The level gaging stations would be located on the field side of the roads along the North and East drainage canals with a small pipe tapping into the canals below the water surface. To avoid the need to bring in new electrical service, the facility would be solar powered.

As a result of the diversion consolidation, some re-operation of the drainage canal system would need to occur. The primary change in flow through the drainage canal system would result from the elimination of the Riverside Pumping Plant and replacement of that supply with water re-lifted at Pumping Plant No. 3. This change would result in a maximum increase in withdrawal from the drains at Pumping Plant No. 3 of 45 cfs.

Another change resulting from consolidation would occur from the relocation of the water supply from the Northern Pumping Plant at the T Drain to the Sankey Diversion (flow would enter the North Drainage Canal from the Sankey Drain at Pumping Plant No. 4). This change would result in up to a 100 cfs increase in flow in the North Drainage Canal between Pumping Plant No. 4 and the T Drain^{17, 18}. The remainder of the drain water supply and withdrawal points would remain unchanged. The amount of tailwater entering the system would remain unchanged, as the project has no effect upon overall irrigation patterns, and there would be no increase in the amount of water recirculated. There would be a minor increase in the amount of fresh river water being routed through the system (to supply water for re-lift at Pumping Plant No. 3) and there would be a more consistent flow pattern from the supply point to the point of use. The increase in fresh water input into the drainage system and the more consistent circulation patterns would be expected to increase the overall level of drain water quality by increasing circulation through areas in the middle of the basin that have limited turn over of water under current conditions.


¹⁷ The spill from the Northern Main Canal at the T Drain would not be eliminated, and some of this T Drain flow would remain for operational control of levels in the Northern Main.

¹⁸ The North Drainage Canal conveyance area is largest in this reach, as the highest winter flows occur in this reach in routing drainage to Pumping Plant No. 4; therefore, sufficient capacity exists for these minor additional flows without the need for system modifications.



SITE PLAN

SCALE: 1"=5'

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OCTOBER 2007		SRS	
SUBMITTED		APPROVED	
NATOMAS MUTUAL WATER COMPANY			
AMERICAN BASIN FISH SCREEN AND HABITAT IMPROVEMENT PROJECT ABFS PROPOSED ACTION – PHASE III ELKHORN CHECK AND LIFT PUMPS SITE PLAN			
SCALE OF ORIGINAL: 1" = 5'			
FIGURE 2-15			

To replace the Riverside Pumping Plant diversion's supply eliminated by consolidation, up to 45 cfs of additional flow would be routed through the drainage system to Pumping Plant No. 3. Given the natural fall of the system from north to south, during certain times of the year much of this water is naturally available in the southern portion of the system. When water is available, it would be drawn up the West Drainage Canal and into the inlet to Pumping Plant No. 3^{19,20}.

This re-operation would reduce the recirculation pumping required at the Elkhorn and County Line checks during periods when there is excess water in the southern portion of the drainage system. The demand for overall river supply flows would remain unchanged, since irrigation patterns are unchanged, however the water distribution in the drainage system would be more efficient (i.e., when the proper conditions exist, water supply for the re-lift pumping plants in the north area would be from the river diversions in lieu of water drawn up from the southern area by re-lift pumping at the Elkhorn and County Line checks).

Maximum increases in flow through the drainage system would occur during periods of maximum demand and minimum tailwater supply, which occurs at the beginning of the irrigation season when crops are being established. During this period, up to 45 cfs of additional flow would need to be routed from the Sankey Diversion to the Riverside system. This water supply would be routed from the Sankey Diversion via the Sankey Drain and would enter the North Drainage Canal at Pumping Plant No. 4. Water would flow south through the North Drainage Canal to the confluence with the East Drainage Canal. Flow would then continue moving south down the East Drainage Canal, with a spill at the County Line and Elkhorn Checks, to the confluence with the West Drainage Canal. Water would then be drawn up the West Drainage Canal to the inlet at Pumping Plant No. 3, and would then be re-lifted at Pumping Plant No. 3 to replace the Riverside system supply. This routing would increase the movement of irrigation flows by up to 45 cfs in the following drainage canal reaches:

- North Drainage Canal, between Pumping Plant No. 4 and the confluence with the East Drainage Canal;
- East Drainage Canal, between the North Drainage Canal and the confluence with the West Drainage Canal;
- West Drainage Canal, between the East Drainage Canal and the inlet to Pumping Plant No. 4; and
- Pumping Plant No. 3 inlet canal, between the West Drainage Canal and the pumping plant.

¹⁹ This is an existing flow pattern for the current irrigation re-lift pumping at Pumping Plant No. 3.

²⁰ As these drainage canals are sized for the much higher winter drainage flows, sufficient capacity exists for rerouting of the additional flow without system modifications.

In addition, the diversion consolidation would move up to 100 cfs of the drainage canal supply for the North Drainage Canal from the T Drain spill to Pumping Plant No. 4, as previously described. All of these drainages are sized for the much higher flows which occur during winter storm events when the system is operated for flood control purposes; therefore, sufficient conveyance capacity for these minor increases exists without the need for system modifications. To provide conveyance for this rerouting, the maximum change in water level would occur in the North Drainage Canal at Pumping Plant No. 4, and would be no more than 0.9 foot higher than normal.

This maximum increase is less than the normal level fluctuation in the drainage canal system during the irrigation season, and would occur during the periods when drain levels are at their lowest. The increased flows would increase velocities by no more than 0.3 foot per second, which would occur in the North Drainage Canal just upstream of the confluence with the East Drainage Canal where the conveyance section is the smallest. Velocities in the drainage canal system are normally low (less than 2 feet per second) and would remain low in all of these reaches (less than 2 feet per second).

FACILITY DECOMMISSIONING AND REMOVAL

Introduction

Existing irrigation facilities would be phased out as they are replaced with proposed facilities. The five existing pumping plants and the Verona Diversion Dam and Lift Pumps would be decommissioned when they are replaced by the new diversion facilities. These existing diversion facilities would remain operational until all testing and start-up is complete and the new diversions are fully operational.

Pumping Plants

The five existing pumping plants would be removed when new diversion facilities are operational. Discharge pipes through the levees would be removed or abandoned in place by filling with concrete in accordance with the State Reclamation Board standards. Outfalls, including any rubble and debris, would be removed during interconnection of facilities. Pumps and platforms would be removed, and wooden pilings in the Sacramento River would be removed or cut-off at the base. Existing historical pump houses at the Elkhorn and Riverside pumping plants would be left, but pipes would be removed along with walkways for river pump platform access. At the three Sacramento River diversion structures (Prichard, Riverside, and Elkhorn), rubble and debris would be removed from the bank in the vicinity of the pump platforms and bank revegetation would be performed in accordance with permit conditions. At

the two NCC diversions structures (Northern and Prichard), rip rap would be left in place to serve as potential habitat for GGS.

Verona Diversion Dam and Lift Pumps

The Verona Diversion Dam and Lift Pumps would be removed when new diversion facilities are operational. Pumps and pump platforms would be removed and piles would be cut off at the base. The bulkheads would no longer be used and bulkhead supports would be cut off at the base by divers. Dewatering would not be necessary. Piping would be removed or abandoned in place. Rubble and debris would be removed from the site, and access roads and parking areas would be scarified and revegetated in accordance with permit conditions.

Construction Sequencing

Each phase of the ABFS Proposed Action would be constructed in six overlapping steps, as follows:

Step 1 – Relocation and Site Preparation

- Relocate distribution facilities as required to maintain irrigation service during project implementation
- Relocate utilities as required prior to start of construction
- Clear work areas

Activities would generally be performed in the fall and spring, preceding the beginning of facility construction. Work on irrigation facilities would be performed after the last irrigations in early September and before the first irrigations in late April, except as limited by permit construction windows. Where timing would not permit the performance of these activities outside of the irrigation season, the work may be performed during the summer months, provided water supplies are not interrupted.

Step 2 – Construction of Intake Facility (Phases I and II only)

- Construct sheet pile cofferdam(s) and dewater construction area(s) for in-stream construction activities
- Excavate and prepare foundations for intake structure(s), pump discharge pipes over the levee, and pump sump(s)
- Construct concrete structures
- Install underground and waterside mechanical and electrical equipment
- Backfill structure(s) and finish grade below water areas
- Remove dewatering facilities
- Place rock bank protection

- Complete finish grading and implement erosion control measures at intake site(s)

Under each phase, construction activities would begin in early May of year 1, and every effort would be made to complete the work by no later than December 1, but may require a two-year construction window. Cofferdam installation would begin no earlier than June 1 and any in-river activities outside of the enclosed cofferdam would only occur during the in-water work window, from July 1 through November 30. Cofferdam construction would last approximately 3 to 10 weeks depending upon the facility and the site conditions. After completion of the cofferdam(s), the work site would be isolated from the river. Where intake construction extends over two seasons, additional precautions would be taken for over-wintering at the construction sites and work would only continue in accordance with a plan approved by the permitting agencies.

Step 3 – Installation of Equipment and Start-Up

- Construct equipment building
- Upgrade electrical service
- Complete mechanical and electrical equipment installation
- Perform facility start-up and testing

Under each phase, construction activities would follow completion of facility construction and site work under Step 2. These activities could continue through the winter between years 1 and 2. Start-up testing would be performed through the spring and summer of year 2 as the facility is brought on line.

Step 4 – Construction of New Distribution Facilities

- Construct new irrigation canals and associated improvements
- Upgrade existing distribution facilities
- Complete finish grading and implement erosion control measures

Under Phases I and II, construction of new facilities would be completed in the summer of year 1 and interconnection with existing facilities would occur in the spring of year 2 as necessary. Phase III would be completed within one year.

Step 5 – Modification of Existing Distribution System

- Relocate existing irrigation canals and associated improvements
- Interconnect with existing facilities
- Complete finish grading and implement erosion control measures

Work would be scheduled to avoid impacts on irrigation deliveries. This work on existing irrigation facilities would be performed in the spring and fall of year 1. Interconnections and work on existing irrigation systems that require interruption of flows would be performed after the last irrigations in early September and before the first irrigations in late April.

Step 6 – Demolition

- Dismantle existing pumping plants and salvage equipment and materials
- Abandon or remove pipes through levees

Project construction would be sequenced to minimize the potential for environmental impacts, avoid disruption of irrigation service, and comply with permit conditions. The construction schedule for Phases I and II would extend over a two-year period. Phase III would be completed within one year.

Work would be performed in the spring and summer for each phase following the completion of diversion facility startup and testing.

Site Access and Road Construction

Access for construction of the Sankey Diversion and associated canal improvements (Phase I) would be directly off of the Garden Highway and Sankey Road. The Sankey Canal could also be accessed off of the North Drainage Canal at Plant 4. The Garden Highway would be closed for construction of the pipe crossing through the levee, with traffic temporarily routed around the site via Sankey Road for 2 to 4 months. To maintain continuous access around the site, the realignment of Sankey Road would be completed after the levee construction is complete and prior to interconnection of the diversion outfall with the Sankey Canal.

Access for construction of the Elkhorn Diversion and associated canal improvements (Phase II) would be directly off of the Garden Highway. The Elkhorn Main Canal would be directly accessed off of Elverta Road. The Garden Highway would be temporarily closed and a detour established for approximately four weeks to facilitate construction of the pipe crossing through the levee. No private residences are located along this portion of the Garden Highway; farmers would be provided with alternative access. Garden Highway detours would be set up at Elverta Road and at North Bayou Way with traffic rerouted along Powerline Road.

Elverta Road would be temporarily closed and a detour established for approximately 4 weeks to facilitate replacement of the culvert crossing for the Elkhorn Main Canal (Phase II). Temporary access would be provided for property owners with driveway crossings that require culvert

upgrades for the canal construction. Elverta Road detours would be set up at the Garden Highway and at Powerline Road.

Two road closures of the Garden Highway of less than four weeks each would be required for the removal of pipes through the levee, associated with the decommissioned Prichard (Phase II) and Riverside (Phase III) Pumping plants.

Access for Pumping Plant No. 3 construction and associated Riverside Main Canal improvements would be directly off of the Garden Highway. The Elkhorn Main Canal would also be directly accessed off of Radio Road. Access would be provided for property owners with driveway crossings that require culvert upgrades for the canal construction. The work would likely be completed on only one-half of the roadway at a time to minimize inconvenience.

No road closures are required for any of the interior distribution system improvements. All facilities would be accessible from the nearest public roads.

Staging Areas

In addition to the permanent right-of-way and construction easements along the canals, several construction staging areas would be needed for facility construction. Upon completion of construction activities, the staging areas would be cleaned up and restored to their original use. At the Sankey Diversion, approximately one acre of an existing agricultural field on the landside of the levee would be reserved for staging, adjacent to the proposed outfall. At the Elkhorn Diversion, approximately one acre on the field side of the existing pumping plant outfall would be set aside for staging. This area is currently utilized as staging for Natomas Mutual maintenance activities.

A temporary canal crossing would be required to access this area from the Garden Highway. A potential staging area of approximately one acre is also planned at Elverta Road in the agricultural field on the north side of the road and on the field side of the canal. For the Pumping Plant No. 3 and Riverside Main Canal construction, approximately one acre is planned as a staging area at the existing farming staging pad located about 1,500 LF downstream of Pumping Plant No. 3. This area is readily accessible from the Garden Highway and is already used for farming activities. Work on the interior facilities would be staged from the existing disturbed upland areas along the maintenance roads.

Borrow Material

Soil materials must be imported for various construction activities. This paragraph summarizes the amount and the available sources of borrow materials that are anticipated for the ABFS

Proposed Action. While the availability of borrow sources would vary depending upon when the project is implemented, this section describes a number of potential borrow sources currently available in the project vicinity. Final selection of borrow sources would be made when construction commences. The material would be hauled to the site access points, as described in preceding sections, via existing state highways and county roads, and analysis is based upon maximum haul distances anticipated.

The primary source of fill material for the Sankey Diversion and Sankey Canal improvements would be the Sankey Drain excavation, which would generate approximately 160,000 cubic-yards (CY) of soil material. The remaining material required for the Sankey facilities would be no more than 250,000 CY. The primary sources of fill material for both the Elkhorn and Riverside Main Canals would be the reuse of the existing canal embankments. The remaining material required would be no more than 65,000 CY for the Elkhorn Main Canal, and 90,000 CY for the Riverside Main Canal.

Materials would be obtained from adjacent agricultural fields and existing stockpiles whenever practical. Other potential borrow sources would be:

- Existing soil stockpile at the Sacramento International Airport.
- Existing soil stockpiles within Metro Air Park.
- Reclamation District 1001 commercial borrow source.
- Stockpiles of soil material from grading work in the North Natomas Community Plan Area

Back-up sources of material include SAFCA-approved borrow sources at Elkhorn Boulevard and the Natomas East Levee, and at the Natomas East Levee between Riego and Elverta roads, excess materials from grading work for TNBC habitat restoration work, and the Port of Sacramento.

PROPOSED CONSTRUCTION MEASURES

Natomas Mutual has included the following Proposed Construction Measures into the project description for the ABFS Proposed Action to avoid or minimize the impacts of the project. These measures will be included in the construction specifications provided to bidders to ensure they are implemented during construction of the project.

Terrestrial Biology

Avoid or minimize adverse effects to special-status wildlife species, including federally and state-listed species and other species of concern. This measure includes several species-specific avoidance and minimization measures, which are identified below:

- *Comply with take avoidance, minimization, and mitigation measures for canal maintenance.* Take avoidance, minimization, and mitigation measures for canal/ditch maintenance have been developed by Natomas Mutual as part of its application for participation in the Natomas Basin Habitat Conservation Plan (NBHCP) (see **Appendix F**). These will be used throughout its service area to minimize potential adverse effects of project construction on giant garter snakes and other species inhabiting the canals and irrigation ditches.

Swainson's Hawk

- Pre-construction surveys shall be conducted by a qualified biologist to determine whether any active Swainson's hawk nests are located within 0.5 mile of construction activities. These surveys shall be conducted according to the Swainson's Hawk Technical Advisory Committee's (May 31, 2000) methodology or updated methodologies, as approved by CDFG. If an active Swainson's hawk nest is found, Natomas Mutual will consult with CDFG, and if necessary, obtain an incidental take permit issued pursuant to Fish and Game Code 2081 prior to initiation of ground disturbing activities.
- The footprint of the new Elkhorn Diversion (Phase II) shall be staked in the field prior to construction. Then, the nest tree used during that year shall be evaluated as to its location, proximity to disturbance, timing of construction, and existing visual buffer. Any mature trees that require removal in the vicinity of an active Swainson's hawk nest shall be removed during the non-nesting season (from November through the end of February). If the removal of trees is not possible during the non-nesting season, Natomas Mutual shall consult with CDFG regarding the proposed timing and additional measures that may be necessary to avoid disturbing nesting birds.
- Specific measures to reduce nest disturbance, to prevent loss of nest trees, and to mitigate the loss of Swainson's hawk nest trees are provided in the NBHCP (City of Sacramento *et al.* 2003, page V-9 to V-12). These measures shall be adhered to during construction of the ABFS Proposed Action if any Swainson's hawk nest trees are removed. Specific measures identified to mitigate the loss of Swainson's hawk nest trees include a requirement that 15 trees (5 gallon container size) are to be planted within the TNBC habitat reserves for every Swainson's hawk nest tree that is

removed. Monitoring of replacement trees shall be conducted for a period of 5 years, and remedial action shall be taken, to ensure that the number of trees alive and in good health meets the agreed-upon criteria at the end of the 5-year monitoring period.

Giant Garter Snake

- All work within potential giant garter snake habitat, including activities within aquatic habitat and adjacent uplands within 200 feet of supporting aquatic habitat, shall occur between May 1 and October 1 of any year, with exceptions made to extend this window during periods of warm or temperate conditions, subject to the discretion of regulatory agencies and the monitoring biologist.
- To reduce potential impacts to giant garter snakes, any dewatered aquatic habitat shall remain dry for at least 15 consecutive days after April 15 and prior to excavating or filling of such habitat.
- Construction and maintenance personnel shall participate in an USFWS-approved worker environmental awareness training program. Under the guidelines of this program, workers shall be informed about the presence of giant garter snakes and habitat associated with the species and that unlawful take of the animal or destruction of its habitat is a violation of the ESA. Prior to construction activities, a qualified biologist approved by the USFWS shall instruct construction personnel about: (1) the life history of the giant garter snake; (2) the importance of irrigation canals, marshes/wetlands, and seasonally flooded areas, such as rice fields, to the species; and (3) the terms and conditions of the biological opinion. Colored photographs of the giant garter snake shall be handed out during the training session for posting on the job site. Proof of this instruction shall be submitted to the USFWS, Sacramento Fish and Wildlife Office.
- No more than 24 hours prior to the commencement of certain construction activities (i.e., clearing, grading, excavation, etc.) in giant garter snake habitat, a pre-construction survey shall be undertaken by a qualified biologist. The biologist shall prepare a field report documenting the monitoring efforts and shall submit a copy to the USFWS Sacramento Fish and Wildlife Office.
- The monitoring biologist shall be available thereafter on an on-call basis. If a snake is encountered during construction activities, the biologist shall have the authority to halt work until appropriate corrective measures have been implemented or it is determined that the snake shall not be harmed. Giant garter snakes encountered during construction activities shall be allowed to move away from construction activities on their own. Capture and relocation of trapped or injured individuals can only be attempted by personnel or individuals with current USFWS recovery permits

pursuant to Section 10(a)1(A) of the ESA.

- Vegetation clearing shall be confined to the minimal area necessary to complete the construction activity. Future dredging of channels to remove accumulated sediments as part of ongoing maintenance shall be accomplished by using equipment located on, and operated from, the top of the bank, with the least interference practical for emergent vegetation.
- During construction operations, the number of access routes, number and size of staging areas, and the total area of the ABFS Proposed Action activity shall be limited to the minimum necessary. Routes and boundaries shall be clearly demarcated. Movement of heavy equipment to and from the project site shall be restricted to established roadways to minimize habitat disturbance. Project-related vehicles shall observe a 20-mile-per-hour speed limit within construction areas, except on county roads and on state and federal highways. This is particularly important during periods when giant garter snakes may be basking or moving on roadways.
- During construction operations, stockpiling of construction materials, portable equipment, vehicles, and supplies shall be restricted to the designated construction staging areas.
- Install protective fencing between potentially suitable giant garter snake upland habitat and the specific work area to minimize the chance of “take” (at the discretion of the USFWS).
- Natomas Mutual and its contractors shall ensure that the temporary loss of giant garter snake habitat is confined to the ABFS Action footprint.
- To eliminate an attraction to predators of the snake, all food-related trash items, such as wrappers, cans, bottles, and food scraps, shall be disposed of in closed containers and removed at the end of each workday from the entire work area.
- Tightly woven fiber netting or a similar material shall be used for erosion control and other purposes to prevent the entanglement of giant garter snakes that may occur with monofilament or jute netting. This limitation shall be communicated to the contractor using special provisions included in the bid solicitation package.

Burrowing Owl

- To protect burrowing owls, no disturbance of occupied burrows shall be permitted during the nesting season (typically February 1 through August 31) unless a qualified biologist approved by CDFG verifies that either the birds have not begun egg-laying and incubation, or that juveniles from the occupied burrows are foraging independently and are capable of independent survival.

- No disturbance within 50 meters (approximately 160 feet) of occupied burrows during the non-breeding season of September 1 through January 31 or within 75 meters (approximately 250 feet) during the breeding season of February 1 through August 31.
- Conduct surveys for burrowing owls in accordance with DFG's 1995 staff report on burrowing owl mitigation.
- Avoid destruction and/or degradation of foraging habitat within 100 meters of an occupied burrow.

VELB

- Implement the conditions of the USFWS (1999a) conservation guidelines for the VELB.
- Follow the guidelines provided in the USFWS (1997) formal programmatic consultation prepared for the U.S. Department of Transportation, Federal Highway Administration for projects with relatively small effects on the VELB.

Riparian Habitat

- Erect temporary fencing during construction activities around adjacent riparian habitat that is not to be cleared to avoid inadvertent disturbance to this sensitive habitat.

Native Trees

- Comply with the tree preservation ordinances as applicable. Trees to be protected will be fenced around their driplines during construction with orange construction fencing to avoid damage to limbs and trunks and soil compaction from heavy equipment during construction. Mitigation for the removal of native trees (e.g., valley oaks) that are greater than six inches diameter at breast height (dbh) will be conducted pursuant to County ordinances.

Aquatic Biology

Avoid or minimize adverse effects to special-status fish species, including federally and state-listed species and other species of concern. This measure includes several species-specific avoidance and minimization measures, which are identified below:

- Compliance with applicable measures identified in USFWS and NMFS biological opinions in *effect* for federally listed species will be established.

- Construction and maintenance activities will be conducted according to site-specific construction plans to minimize the potential for sediment input into the system. Plans will comply with SWRCB, Central Valley Regional Water Quality Control Board (CVRWQCB) and CDFG requirements.
- Construction and maintenance activities will be conducted according to site-specific plans to minimize the potential for contaminants to enter water courses and drainage, and to effectively respond to accidental spills.
- Work or equipment operation in flowing water will be minimized by constructing cofferdams to isolate the construction activities from flowing water.
- Avoid actions, including construction, operation, land management, and incidental use that could disturb evaluated species during sensitive periods.
- In-river construction activities associated with the ABFS Proposed Action will be limited to the period from July 1 through November 30.
- Continue to examine USFWS beach seining data from established survey sites within, and adjacent to, the ABFS Proposed Action Area (i.e., Discovery Park, Elkhorn, Verona, Sand Cove, and Knights Landing).
- The disruption of the streambed at, and adjacent to the construction site will be minimized by limiting the areas to be cleared, graded and recontoured.
- Water pumped from within the cofferdams in the internal irrigation system, which is hydraulically isolated from the Sacramento River, will be disposed of. If necessary, water from within the cofferdams would be pumped into desilting basins to allow sediment to settle out and returned to the Sacramento River (at a rate slow enough to minimize the potential for disturbing sediment in the rivers, and inadvertently increasing turbidity), downstream of the intake structures.
- Sheet pilings for the cofferdam would be vibrated into place.
- Pile driving would occur during daylight hours only and would commence at low energy levels and slowly build to impact force.
- A Fish Rescue Plan has been developed (see **Appendix F, Attachment 4**) to minimize potential impacts resulting from placement of the cofferdam, and to safely evacuate fish within the cofferdam before dewatering.

- Natomas Mutual will prepare a Post Construction Evaluation and Assessment Plan for review and approval by USFWS, NMFS, and CDFG. A draft Fish Screen Operations Procedure Plan (Operations and Maintenance Plan) has been prepared for review and approval by USFWS, NMFS, and CDFG; it is included as an appendix to the ASIP (**Appendix F, Attachment 3**). The Operations and Maintenance Plan includes procedures for: (1) operating the fish screens and the intake facilities under a variety of environmental conditions and diversion needs; and (2) periodic maintenance procedures required to ensure the effectiveness of the screens over the design life of the facilities.
- The Fish Rescue Plan will be implemented prior to cofferdam closure. The cofferdam will be constructed via sequential placement of sheet piles from the upstream to the downstream end. Prior to closure of the cofferdam, biologists representing Reclamation, NMFS, USFWS, and Natomas Mutual will snorkel the cofferdam area to conduct a visual count of anadromous salmonids and other Species of Primary Management Concern present to obtain an estimate of the number and type of fish within the cofferdam area. The visual estimate will be conducted from the upstream to the downstream end of the cofferdam. The biologists conducting the snorkeling procedure will horizontally space themselves to provide complete visual coverage of the survey area. Each biologist will carry and use a counting device. As they observe a fish, they will note whether it is a steelhead, a Chinook salmon, an unidentified salmonid, a green sturgeon, or another fish species. The procedure will be performed twice. Repetition of the procedure would provide a first measure of the variation of the visual count. If there is a wide variation between the two estimates, a third visual count will be conducted to obtain a relatively accurate estimate of the number of fish within the cofferdam.
 - After the visual counts are completed, a “crowding net” will be placed at the upstream end of the cofferdam. The crowding net will be constructed of 0.25-inch knotless nylon mesh, 20-feet deep, of sufficient width to span the extension of the cofferdam, with float and lead lines. Because the substrate bottom inside the cofferdam would be of variable elevation, the 20-foot depth of the net is sufficient to reach the deepest areas. Individuals on each side of the cofferdam will hold the crowding net tight at the top and will proceed slowly from the upstream to the downstream end of the cofferdam. Commercial divers will be inside the cofferdam, guiding the bottom of the net, and removing the net from snags, as needed. This procedure will ensure a smooth transition of the net from the upstream to the downstream end of the cofferdam.
 - At the downstream end of the cofferdam, one sheet pile panel, approximately 4 feet wide, will remain open. With assistance of the individuals at the top of the cofferdam and the commercial divers inside the cofferdam, the net will be brought to the downstream end, and collapsed such that it is flush against the surface of

the open panel. The net will remain in place at this location, and manipulated such that the last panel can then be driven into place, with the net serving as an excluding net, preventing fish from reentering the cofferdam. The cofferdam will then be closed. At this time, the biologists will repeat the snorkeling procedure described above to determine whether fish still remain in the cofferdam, and if so, how many. If less than 10 juvenile or adult fish Species of Primary Management Concern are estimated to remain in the cofferdam after its closure, then the fish removal process would be considered complete. Conversely, if 10 or more juvenile or adult fish Species of Primary Management Concern remain within the cofferdam, then the netting procedure would be repeated. After the netting procedure is repeated, the net will be collapsed, and with assistance of commercial divers, the bottom of the lead line will be brought up against the face of the cofferdam. The outside edges of the net will be clasped and pulled up, effectively forming a purse. The fish net will be brought up to the surface, and captured fish will be immediately returned to the river, implementing NMFS' standard protocols for handling anadromous salmonids that are listed under the ESA.

- No later than one month following implementation of the Fish Rescue and Salvage Plan, a Draft Fish Salvage Operation Report will be prepared and submitted to NMFS (Southwest Region, Protected Resources Division, Sacramento Area Office, 650 Capitol Mall, Suite 8-300, Sacramento, CA 95814-4706). The Draft Fish Salvage Operations Report will document the fish rescue and salvage operations, including: (1) the number of fish salvaged; (2) identification and fork length of each species salvaged; and (3) identification and fork length of each sensitive species salvaged, if possible. The Draft Fish Salvage Operations Report will be reviewed by a designated NMFS biologist, and comments, if any, will be submitted to Reclamation, CDFG, USFWS and Natomas Mutual. Once the comments have been satisfactorily addressed, a Final Fish Salvage Operations Report will be issued to comply with reporting requirements associated with the ABFS Proposed Action.

Hydrology and Water Quality

Avoid or minimize impacts to hydrology and water quality. These measures include the requirements required in the permits that will need to be obtained and the plans that need to be prepared prior to construction of the ABFS Proposed Action. These measures are described below, organized by the permit or plan that requires them:

Stormwater Pollution Prevention Plan

Compliance with the NPDES permit would include development and implementation of a SWPPP for the construction site, including staging areas. Required elements of the SWPPP include:

- Specific erosion and sediment control practices.

- Post-construction controls.
- Monitoring and inspection.
- Maintenance activities shall be designed to minimize erosion and control the release of sediments into waterways and also meet the Basin Plan's water quality objectives.

Construction Erosion and Sedimentation Control Plan

Measures that will be included in the *Construction Erosion and Sedimentation Control Plan* include the following:

- Restrictions upon storage and stockpiling of construction materials, including vehicles and supplies, and chemicals or other hazardous materials to designated construction staging areas.
- Designation of vehicle/equipment fueling and wash-down areas, outside of the floodway and designed to contain potential spills.
- Regular maintenance of construction vehicles and equipment such that leaks of fuels, lubricants, and other materials are prevented.
- Removal of construction litter/debris and proper disposal practices at the end of each construction day, and particularly prior to the start of the rain season.
- Requirement to minimize near- and in-river activities to the extent possible.
- Erosion control measures that prevent soil or sediment from entering the river, such as straw bale barriers and sediment traps or basins and including daily monitoring to ensure the effectiveness of such controls. Straw bales and/or silt fences shall be placed between construction grading areas, the river, and channels to ensure that silt does not enter the river or associated channels.
- Terms limiting the period or type of construction activities that occur within the ordinary high water line of the Sacramento River upstream and downstream of the ABFS Action Area site.
- Water pumped from within cofferdam(s) and other construction zones shall be discharged into settling basins. Sediment shall then be allowed to settle until turbidity levels are below ambient water quality conditions prior to release back to project waterways.
- Implementation of post-construction management activities including restoration or improvement of drainage patterns and stabilization of stream banks and hillsides (upland areas) within the construction area; stabilization may include re-vegetation with a seed mix of plants native to the area, mulch or some other form of protection.

Spill Prevention and Countermeasure Plan

Preparation of a Spill Prevention and Countermeasure Plan will be completed before initiating construction. Mitigation measures to be included in the plan include, but are not limited to, storing reserve fuel supplies in staging areas, refueling equipment in designated areas in staging areas, and inspecting construction vehicles daily for leaks. Excavated material will be stored away from water sources.

Erosion and Sedimentation Control Best Management Practices

Best Management Practices (BMPs) for construction activities are designed to minimize erosion and control sedimentation so that the release of sediments and other materials into the river is minimized. Specifically, the BMPs are intended to:

- Minimize soil disturbance/vegetation removal.
- Stabilize and revegetate soils after disturbance and before the rainy season.
- Trap loosened sediments.
- Design an adequate stormwater runoff control system.

The following measures, in addition to regulatory permit terms and conditions, would ensure the protection of water quality at and downstream of the ABFS Action Area:

- All materials to be removed from the river and canals shall be deposited in designated material disposal locations and stabilized prior to re-watering.
- Due to the scope and duration of the construction activities, the construction contractor shall be responsible for daily water quality monitoring at designated sampling sites upstream and downstream of the construction activity to confirm that the Basin Plan water quality objectives are being met. Should the monitoring results indicate an unacceptable increase of turbidity levels due to construction activities, the lead agencies, in consultation with the CVRWQCB, would develop and implement additional protective measures to prevent water quality impacts.

Streambed Alteration Agreement Application

The Streambed Alteration Agreement application and conditions will include, but will not be limited to the following:

Sacramento River

- Removal of vegetation shall occur only when absolutely necessary.
- Requirement to stabilize and revegetate disturbed soil surface before the rainy season.

- All contractors and subcontractors doing the work shall be provided copies of the Streambed Alteration Agreement by the applicant. Copies of the agreement shall be readily available at work sites at all times during periods of active work and must be presented to any CDFG personnel, or enforcement personnel from another agency upon demand.
- The operator shall monitor instream turbidity levels during construction activities and shall adhere to those specifications for turbidity set forth by the CVRWQCB's waste discharge requirements issued for the project. If turbidity or pH levels have not been set by the CVRWQCB, then CDFG shall require that water quality monitoring for: (1) pH, if necessary; (2) turbidity; and (3) settleable solids be performed using procedures in accordance with Standard Methods 17th edition (American Public Health Association 1991).
 - CDFG required samples shall be collected as follows: one sample 100 feet upstream from the ABFS Action Area and one sample 300 feet downstream from the ABFS Action Area within the turbidity plume. If no visible plume exists, the downstream sample shall be collected two feet from the shoreline at the 300-foot point. All sample results shall be maintained in a log on site, and shall be available for immediate inspection.
 - All instream activities and any discharges due to project activities shall at all times attain the turbidity requirements of no more than 20 percent turbidity above the background level, and no more than 0.5 percent pH above the background level. Measurements of pH would only be necessary if water from within the cofferdams needs to be pumped into desilting basins to allow sediment to settle out and then returned to the Sacramento River (at a rate slow enough to minimize the potential for disturbing sediment in the rivers, and inadvertently increasing turbidity), downstream of the intake structures.
- Instream silt containment barriers shall be installed to catch material from the worksites. These barriers shall be installed immediately downstream of the ABFS Action Area.
- Fines and silt-laden gravels shall be removed from the ABFS Action Area containment barrier areas upon completion of the project. These gravels shall not be placed where they may enter waters of the state.
- Areas of disturbed soil, which slope toward the river, shall be stabilized to reduce erosion potential. Planting, seeding, and mulching are conditionally acceptable. Where suitable vegetation cannot reasonably be expected to become established, non-erodible material shall be used for such stabilization. Installation of non-erodible materials not described in the original project description shall be coordinated with the CDFG.

- Passage of sediment beyond the sediment barrier is prohibited. If the sediment barrier fails to retain sediment, corrective measures shall be employed, and CDFG notified immediately.
- Spoil sites shall not be located within the river, where spoil could be washed back into the river, or where it could cover aquatic or riparian vegetation.
- Temporary fills shall be constructed of nonerodible materials, and shall be removed immediately upon work completion.
- The Contractor shall have readily available plastic sheeting or visqueen, and shall cover exposed spoil piles and exposed areas to prevent these areas from eroding loose soil into the river. These covering materials shall be applied when it is evident rainy conditions threaten to erode loose soils into the river.
- Spoil shall not be placed over riparian vegetation except as specifically noticed to and accepted by the CDFG.
- Fill materials may come from on-site sources or be imported. Fill shall be limited to the minimal amount necessary to accomplish the agreed-upon activities. Fill material shall be free from contaminants such as trash, debris, or other materials deleterious to aquatic life or water quality. Fills shall be heavily compacted. Fills within the normal high-water mark shall be armored against erosion by the placement of rock riprap, gabions, concrete, or other suitable nonerodible material. To prevent undercutting, the armor shall be keyed in place.
- Precautions shall be taken so that runoff from steep, erodible surfaces is diverted into stable areas with little erosion potential. A sufficient number of water bars shall be placed on dirt roads, cat tracks, or other work trails to control erosion.
- Erosion control measures shall be utilized throughout all phases of operation where sediment runoff from exposed slopes threatens to enter waters of the state. At no time shall silt-laden runoff be allowed to enter the river or be directed to where it may enter the river.
- If silt catchment basins are used, the basins shall be constructed across the stream immediately downstream of the ABFS Action Area prior to the beginning of work. Catchment basins shall be constructed of materials that are free from mud and silt. Upon project completion, basin materials, along with the trapped sediments, shall be removed from the stream in such a manner that said removal does not introduce sediment to the stream.
- The silt catchment device shall be maintained throughout the life of the project to ensure proper function, including, but not limited to, periodic excavation of accumulated sediments.

- Staging and storage areas for equipment, materials, fuels, lubricants and solvents, shall be located outside of the stream channel and banks. Equipment or vehicles driven and/or operated within or adjacent to the stream must be checked and maintained daily, to prevent leaks of materials that if introduced to water could be deleterious to aquatic life. Vehicles must be moved away from the stream prior to refueling and lubrication.
- Heavy equipment driven in wet portions of the river channel to accomplish the necessary work shall be authorized only when the vehicle is completely clean of petroleum residue and water levels are below the gear boxes of the equipment in use or lubricants and fuels are sealed such that inundation by water shall not result in leaks. The equipment shall be steam-cleaned prior to entering a watercourse.
- Work consisting of pouring concrete shall only be done in dewatered areas. Concrete shall be poured in leak-proof forms. Gunnite may be sprayed.
- Structures and associated materials not designed to withstand high seasonal flows shall be removed to areas above the normal high-water mark before runoff from the first seasonal rains or by November 1.
- Stationary equipment such as motors, pumps, generators, and welders located within or adjacent to a channel shall be positioned over drip pans.
- The cleanup of spills shall begin immediately. CDFG shall be notified of spills immediately by the Operator, and shall be consulted regarding cleanup procedures.
- Mechanical operating equipment shall be cleaned and maintained prior to use. Construction waste products shall be removed from the project site and dumped at a legal point of disposal. The use of wood preservatives on wood in contact with the water is prohibited. Waste shall not cause pollution or threaten pollution.
- No debris, soil, silt, sand, bark, slash, sawdust, rubbish, cement or concrete or washings thereof, oil or petroleum products, or other organic or inorganic material from construction or associated activity of whatever nature shall be allowed to enter into or placed where it may be washed by rainfall or runoff into the river. When operations are completed, excess materials or debris shall be removed from the work area. No rubbish shall be deposited within 150 feet of the high water mark of the river.

Natomas Cross Canal and Internal Drainage Canals

- Prior to working within the Sacramento River, NCC, and interior drainage canals (State Waters) all heavy equipment shall be closely examined for oil and fuel discharges. All equipment operated within or adjacent to the waterway shall be checked and maintained daily, to prevent leaks of materials that if introduced to water could be deleterious to aquatic life. Petroleum products, and other substances that could be hazardous to aquatic life, resulting from project related activities, shall be prevented from contaminating the soil and/or entering waterways. Any of these materials, placed within or where they may enter a waterway, by Operator or any party working under contract, or with the permission of the Operator, shall be removed immediately. CDFG shall be notified immediately by the Operator of any spills and shall be consulted regarding clean-up procedures.
- Raw cement/concrete or washings thereof, asphalt, paint or other coating material, oil or other petroleum products, or any other substances which could be hazardous to aquatic life, resulting from project related activities, shall be prevented from contaminating the soil and/or entering waterways. Any of these materials, placed within or where they may enter a waterway, by Operator or any party working under contract, or with the permission of the Operator, shall be removed immediately.
- Adequate erosion control and water pollution control measures shall be adopted and maintained for the duration of the project in order to prevent deleterious materials from entering the waterway. The Operator/Contractor shall install, when practical, a siltation curtain proximate to the project site. The siltation curtain shall be of effective design to limit and abate heavily silted materials from impacting State Waters.
- Turbidity levels in State Waters resulting from project related activities shall not exceed 20% of the natural turbidity levels as measured 200 feet upstream of the project site. Upon CDFG determination that turbidity/siltation levels resulting from project related activities constitute a threat to aquatic life, activities associated with the turbidity/siltation shall be halted until effective CDFG approved control devices are installed or abatement procedures are initiated.
- Upon CDFG determination that turbidity/siltation levels resulting from project related activities constitute a threat to aquatic life, activities associated with the turbidity/siltation, shall be halted until effective CDFG approved control devices are installed, or abatement procedures are initiated.

- Slope preparation and rock placement will be conducted during periods of low tide to minimize the potential water quality impacts of placing the rip-rap along the water's edge. The bank stabilization material shall extend above the normal high-water mark. Only clean material that is free of trash, debris and deleterious material, such as, rock rip-rap or broken concrete free of exposed rebar shall be used as bank stabilization. Asphalt is prohibited. Broken concrete should be sized 18 to 24 inches in its greatest dimension. All rock slope protection work shall be done from the top of the stream or canal bank unless otherwise authorized. Equipment shall not be operated in the flowing portion of the river without the prior approval of the CDFG.
- Equipment and material staging and storage areas shall be located away from the waterside of the levee. All equipment, maintenance materials, and other items considered to be pollutants shall be stored away from the water. Any spills of hazardous materials, petroleum products or other pollutant shall be reported immediately to the appropriate agency without delay.
- During construction, the Operator/Contractor shall not dump any litter or construction debris within the stream zone. All such debris and waste shall be picked up daily and properly disposed of at an appropriate site. All construction related materials shall be removed from the work site upon completion of the project.
- Creosote treated wood products shall not be used in State Waters. Alternatives that may be appropriate include steel, concrete, plastic or wood products treated with EPA approved preservatives that are not deleterious to aquatic life.

Cultural Resources

Natomas Mutual will implement the following measures to minimize construction-related impacts to cultural resources:

- *Avoid construction-related impacts to cultural resources.* During construction, if archaeological resources are discovered, work will be suspended in the immediate vicinity pending site investigations by a qualified archaeologist to assess the materials and determine their significance. If human remains are discovered, work would be suspended in the immediate vicinity and the County Coroner immediately notified. Notification would include the local planning and permitting jurisdictions.

- *Protect known archaeological site CA-SAC-485/H.* The site will be designated and labeled as an Environmentally Sensitive Area on construction plans and the project work limits field-staked prior to the beginning of work. Temporary protective fencing (orange snow fencing) will be erected along eastern limit of the work area as a first order of work. No excavation below original ground level (as shown on the typical cross-section in Figure 2-13) will occur as part of the regrading of the Elkhorn Main Canal in the vicinity of Site CA-SAC-485/H. Site preparation activities will be limited to the deconstruction of the existing canal and disking to a maximum depth of twelve inches, with soil compaction. Absolutely no project activities will be allowed within the ESA including vehicular traffic and equipment storage. A qualified archaeologist shall monitor soil preparation activities.
- The existing pump houses at the Elkhorn Pumping Plant and Riverside Pumping Plant will be retained and protected during any new construction as well as during the subsequent decommissioning of these existing facilities.

Aesthetics

Natomas Mutual shall implement the following measures during construction of the facilities along the Sacramento River to minimize aesthetic effects:

- Install landscape screening, such as grouped plantings of trees and tall shrubs, to screen proposed facilities from nearby viewers such as boaters, recreationists, motorists, and residents, to the extent feasible.
- Construct facilities with earth-tone building materials
- Areas where dust is generated shall be watered, where feasible, particularly along unpaved haul routes and during earth-moving activities, to reduce visual impacts caused by dust.
- Disturbed areas shall be revegetated as soon as possible after construction.
- Vegetation type, placement, and density shall be selected to be compatible with patterns of existing vegetation where revegetation occurs in natural areas.

Air Quality

- Reducing NO_x emissions from off-road diesel powered equipment.
 - The project shall provide a plan for approval by the Sacramento Metropolitan Air Quality Management District (SMAQMD) demonstrating that the heavy-duty (> 50 horsepower) off-road vehicles to be used in the construction project, including owned, leased and subcontractor vehicles, will achieve a project wide fleet-average 20 percent NO_x reduction and 45 percent particulate reduction compared to the most recent CARB fleet average at time of construction; and,

- The project representative shall submit to SMAQMD a comprehensive inventory of all off-road construction equipment, equal to or greater than 50 horsepower, that will be used for an aggregate of 40 or more hours during any portion of the construction project. The inventory shall include the horsepower rating, engine production year, and projected hours of use or fuel throughput for each piece of equipment. The inventory shall be updated and submitted monthly throughout the duration of the project, except that an inventory shall not be required for any 30-day period in which no construction activity occurs. At least 48 hours prior to the use of subject heavy-duty off-road equipment, the project representative shall provide SMAQMD with the anticipated construction timeline, including start date, and name and phone number of the project manager and on-site foreman (SMAQMD 2007).
- *Standard Dust Suppression methods included as part of the project.* The project will include: (1) watering exposed surfaces and disturbed soils daily, and (2) maintaining at least two feet of freeboard on all haul trucks.
- *Control dust and dirt during construction.* Dust and dirt control would be controlled by:
 - watering down dirt piles regularly to prevent dust plumes.
 - using a dust-suppressing watering truck.
 - using tarps to contain dirt on site when sprinkling proves ineffective.
 - maintaining freeboard in trucks hauling material to and from the construction site.
 - covering loaded haul trucks with tarps or water sufficiently to eliminate dust emissions.
 - cleaning visible mud and dirt tracked onto paved surfaces on a daily basis.
- Prepare a dust control plan prior to the start of any construction activities that addresses how the above control measures will be implemented. These measures would minimize construction-period impacts related to air quality.

Geology and Soils

- *Prepare soils and geotechnical evaluation during final design.* The results of these evaluations *would* be incorporated into the project design. This measure would minimize construction-period impacts related to soils and geology.

Hazards and Hazardous Materials

- *Avoid exposure to hazardous materials.* If contaminated soil or groundwater were encountered, the appropriate county's Hazardous Material Division and the local fire departments would be notified. This measure would minimize construction-period impacts related to hazardous materials.

Noise

- *Limit hours of construction in residential neighborhoods.* Construction activity on the project shall be limited to between 6 a.m. and 8 p.m. on weekdays, and 7 a.m. to 8 p.m. on weekends, the limits established by Sacramento County noise policies. This measure would minimize construction-period impacts related to noise, traffic, and light and glare. Sutter County does not have a similar noise policy.
- *Monitor noise levels at the Sankey Diversion during operations.* Natomas Mutual has determined that noise levels at sensitive receptors near the proposed Sankey Diversion during operations will not exceed noise standards. However, to ensure that this is the case, they will monitor noise levels at the sensitive receptors while testing operation of the diversion and fish screen. If noise levels exceed the standard 45 dB L50, Natomas Mutual will construct a wall between the diversion pumps and the receptor to reduce noise levels below the standard.

Transportation and Circulation

- *Prepare disruption plans for traffic for areas where temporary street closures are required.* A Traffic Control Plan would be prepared prior to any road closures. This measure would minimize construction-period impacts related to traffic and circulation.
- *Maintain at all times emergency vehicle access.* This measure would minimize construction-period impacts related to public services.

Other

- *Coordinate with affected utilities to avoid and minimize service disruption.* This measure would minimize construction-period impacts related to utilities and service systems.

2.3.4 ALTERNATIVE 1 - SANKEY DIVERSION

Alternative 1, the Sankey Diversion, consists of constructing one new diversion with a fish screen on the Sacramento River near Sankey Road, approximately 0.25 mile downstream of the confluence with the NCC (see **Figure 2-4**). Other changes to the distribution system under this alternative include:

- Constructing a new highline canal (Sankey Canal) along the landside of the NCC south levee from the existing Northern Pumping Plant outfall to the new Sankey Diversion, with a connection to the existing Bennett Main Canal at the Bennett Pumping Plant outfall, including a new turnout for the replacement supply to the Bolen Ranch Property.
- Construct the Sankey Drain adjacent to the new highline canal from the North Drainage Canal at Pumping Plant No. 4 to the new Sankey Diversion, including re-lift pumping plant at the Bennett for recirculation of tailwater into the Northern and Bennett systems. Flows from the existing Vestal Drain would be incorporated into the new Sankey Drain, which will be wider and longer than the existing Vestal Drain.
- Constructing a new highline canal (Garden Highway Canal) from the proposed Sankey Diversion, south along the Garden Highway, to the existing Prichard Pumping Plant.
- Re-grading the Elkhorn Main Canal between the existing Prichard Pumping Plant and the Elkhorn Diversion.
- Re-grading the Riverside Main Canal from the existing Riverside Pumping Plant outfall to Pumping Plant No. 3 and adding one re-lift pump to the existing Pumping Plant No. 3 sump for replacement of the Riverside Pumping Plant supply.
- Improving the internal drainage canal system, including dredging the North Drainage Canal from the V-Drain to Riego Road and upgrading two control structures, the County Line Check and Lift Pump and the Elkhorn Check and Lift Pumps.
- Enlarging culverts for three road crossings of the North Drainage Canal, between the Pumping Plant No. 2 and the intersection with the East Drainage Canal.
- Decommissioning and removing the existing Verona Diversion Dam and Lift Pumps.
- Decommissioning and removing the five existing Natomas Mutual diversions at the Northern, Bennett, Prichard, Elkhorn, and Riverside pumping plants, and the small privately-owned pump for the Bolen Ranch property.

Alternative 1 would disturb approximately 145 acres, owned by both public and private entities. The following sections describe the Facility Characteristics, Construction Methods, and Operation of Alternative 1.

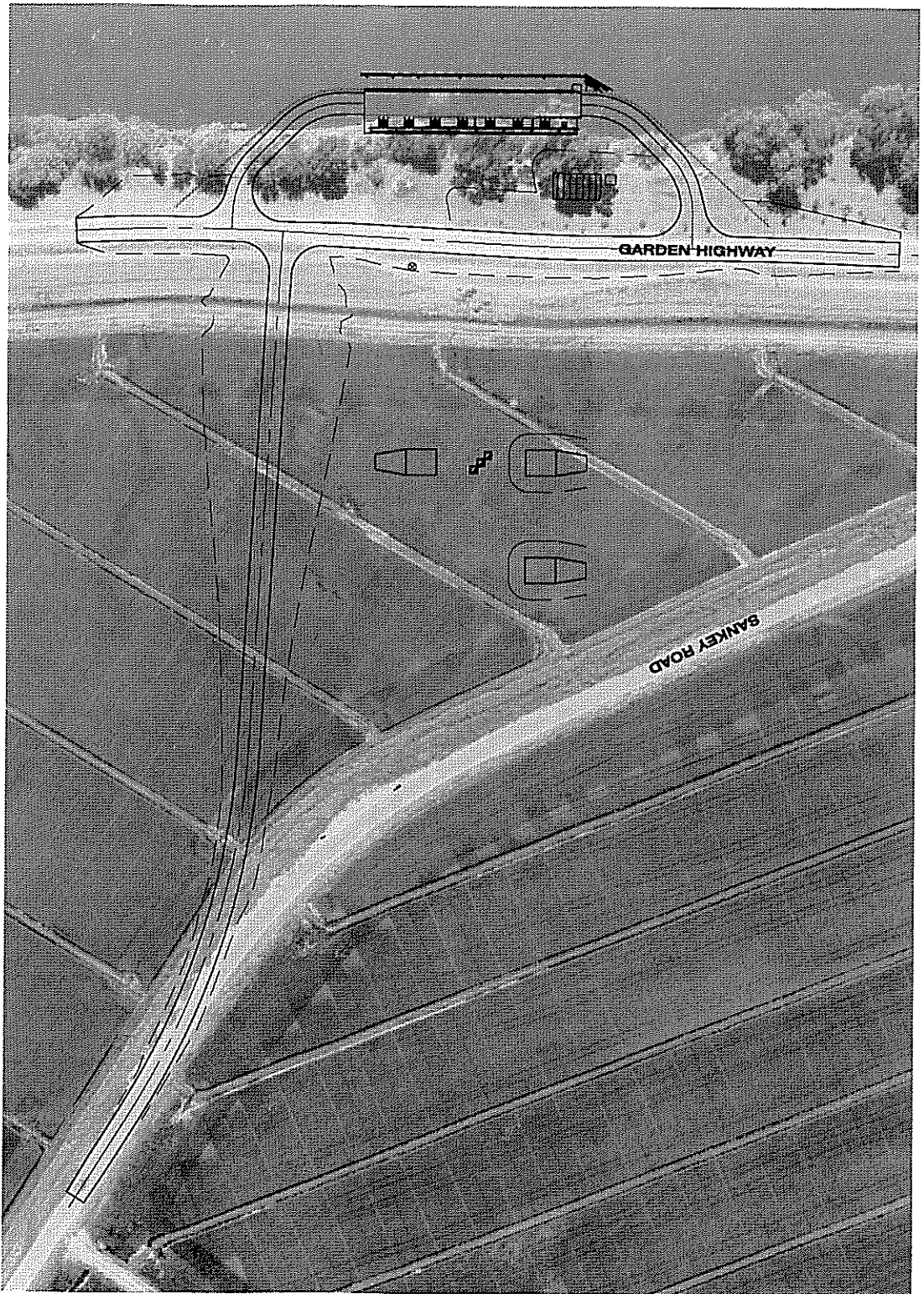
FACILITY CHARACTERISTICS

Sankey Diversion

The new Sankey Diversion would be a 644 cfs capacity pumping plant (at normal operating levels) equipped with a state-of-the-art fish screen system. The facility would be located on the left (east) bank of the Sacramento River, approximately 0.25 mile downstream of the confluence with the NCC. The intake facility would divert water from the Sacramento River and lift the supply into the Sankey Canal and Drain, and the Garden Highway Canal (described in the following sections). The footprint of the proposed facility is shown in **Figure 2-16**. Facility characteristics are similar to the Sankey Diversion described in the Proposed Action with an increase in pumping capacity from 434 to 644 cfs and a resulting increase in screen length.

The facility would have seven identical vertical lift pumps, with two pumps discharging into the Sankey Canal, two pumps discharging into the Garden Highway Canal, and three pumps designed to switch between discharging into the Sankey Drain and the Sankey or Garden Highway Canals, depending upon demand. Pumps would be capable of automatic operation using variable frequency drives to adjust the pump motor speed as required to maintain set water levels in the Sankey Canal, Sankey Drain, and the Garden Highway Canal to suit demands.

The Sankey Diversion intake would be equipped with a positive barrier fish screen. The intake facility would have seven pump bays with an overall screen face length of 270 feet. The overall length of the facility footprint is 70 feet longer than the Sankey Diversion facility described as in the Proposed Action. Otherwise the facility characteristics are the same as the Proposed Action.



<p>MEAD & KUNITZ ENGINEERS 3017 Laguna Hills, Suite 200, Laguna Hills, CA 92653 Phone: (714) 771-1200 Fax: (714) 771-0278</p>	<p>NATOMAS MUTUAL WATER COMPANY AMERICAN BASIN FISH SCREEN AND HABITAT IMPROVEMENT PROJECT ALTERNATIVE 1 SANKEY DIVERSION - SITE PLAN</p>	<p>SCALE OF ORIGINAL: 1"=100'</p>

SUBMITTED
JUNE, 2004

SOS

APPROVED

FIGURE 2-16

Sankey Canal and Sankey Drain

The Sankey Canal and Sankey Drain are new irrigation supply ditches which would interconnect Natomas Mutual's existing Northern and Bennett systems with the new Sankey Diversion and would provide a water supply to the drainage canal system. The Sankey Canal and Sankey Drain under Alternative 1 would be the same as described under the ABFS Proposed Action. Typical canal sections for various reaches are shown in **Figure 2-17**.

Garden Highway Canal

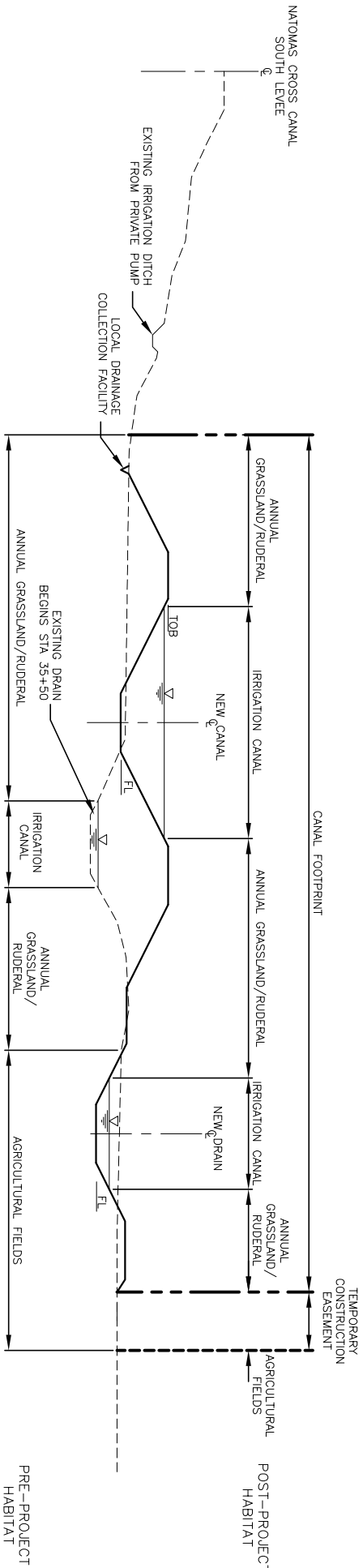
The Garden Highway Canal would be a new irrigation canal along the toe of the Garden Highway, connecting the proposed Sankey Diversion with the existing main irrigation canal at the Prichard Pumping Plant outfall. This canal would replace the supply to Natomas Mutual's existing Central and Elkhorn systems via the Elkhorn Main Canal, as described below. The 18,200 LF canal would be configured to convey water from the Sankey Diversion at the rate and level necessary to replace the existing supply. To match existing demands, the canal would be sized for a peak capacity of 210 cfs for the 18,200 LF reach between the Sankey Diversion and the Prichard Pumping Plant outfall.

Typical canal sections for various reaches are shown in **Figure 2-18**. The canal would be unlined, with earthen embankments. The Garden Highway Canal embankments would provide one foot of freeboard at design capacity. To match the WSEL at the existing Prichard Pumping Plant at design flow with a fall of no more than one foot in 10,000 LF, the design WSEL at the Sankey Diversion outfall would be 30 feet. The footprint for the total cross section would be no more than 125 feet.

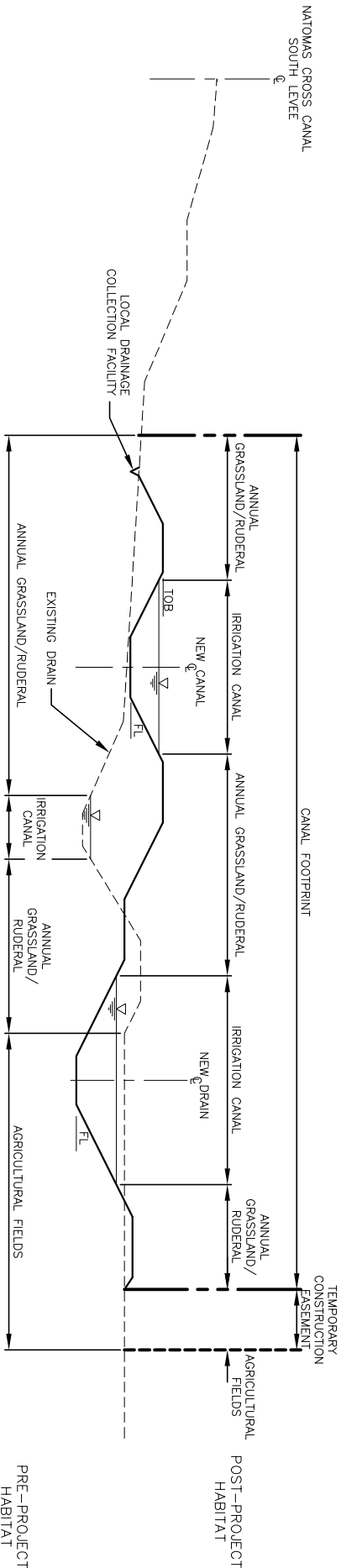
To provide for the increased conveyance capacity, the culverts for existing driveway crossings would be upsized to double 6 by 5-foot concrete boxes. Irrigation and drainage facilities within the existing or new canal footprint (e.g., buried irrigation pipes, an irrigation well, drainage recirculation facilities) would be restored or avoided.

Natomas Mutual does not have any easements for the proposed facility footprint. All right-of-way would be obtained from private landowners. Some exchange of easements with RD 1000, SMUD, and PG&E would also be required.

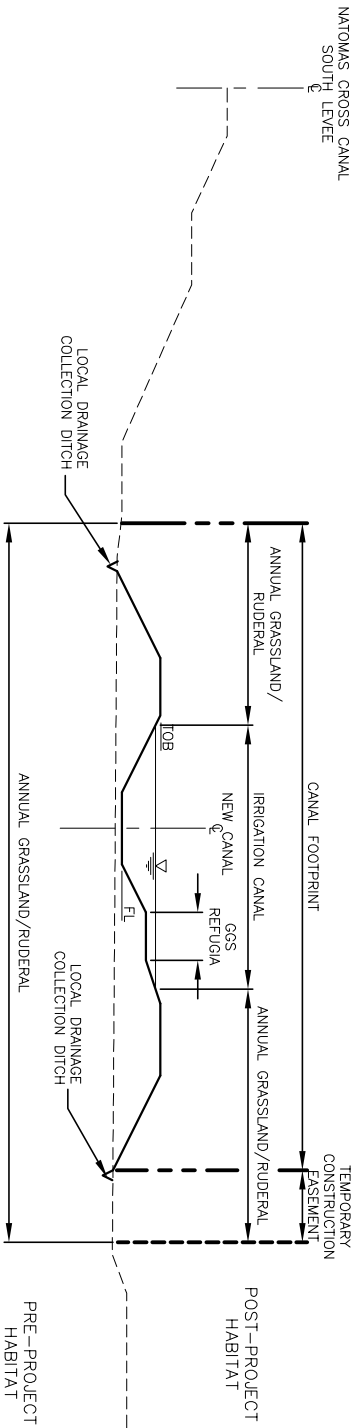
The widened canal footprint would be constructed in maintained annual grassland areas and agricultural fields. Scattered clusters of trees would also be displaced within the canal footprint.




TYPICAL CROSS SECTION
NEW SANKY DIVERSION TO BENNETT PUMPING PLANT

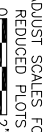


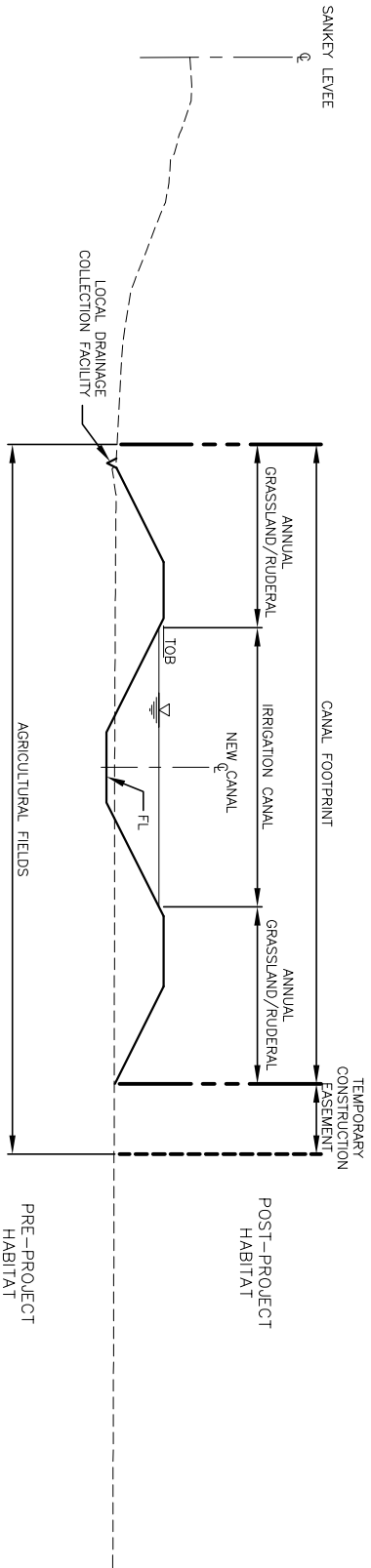
TYPICAL CROSS SECTION
BENNETT PUMPING PLANT TO RD 1000 PUMPING PLANT NO. 4




TYPICAL CROSS SECTION
RD 1000 PUMPING PLANT NO. 4 TO NORTHERN PUMPING PLANT

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3327 Longview Drive Sacramento, California 95821 Phone (916) 971-5961 Fax (916) 971-4578		AMERICAN BASIN FISH SCREEN AND HABITAT IMPROVEMENT PROJECT	
MAY, 2004		ALTERNATIVE 1	
SUBMITTED		SANKY CANAL TYPICAL SECTIONS	
SRS		APPROVED	
		FIGURE 2-17	

VERIFY SCALES
BAR IS TWO INCHES
ON ORIGINAL DRAWING,
ADJUST SCALES FOR
REDUCED PLOTS




TYPICAL CROSS SECTION
ELKHORN CANAL TO SANKEY DIVERSION

<div>MEAD & HUNTENGINEERSARCHITECTSSCIENTISTSPLANNERS3327 Longview Drive Sacramento, California 95821Phone: (916) 971-5961 Fax: (916) 971-4578</div>		NATOMAS MUTUAL WATER COMPANY		VERIFY SCALES BAR IS TWO INCHES ON ORIGINAL DRAWING. ADJUST SCALES FOR REDUCED PLOTS  2"
		AMERICAN BASIN FISH SCREEN AND HABITAT IMPROVEMENT PROJECT ALTERNATIVE 1 GARDEN HIGHWAY CANAL TYPICAL SECTION		
MAY, 2004		SRS		FIGURE 2-18
SUBMITTED		APPROVED		

NOTE: AREAS OF OAK WOODLAND EXIST ALONG THE CANAL, BUT ARE NOT TYPICAL. SEE GARDEN HIGHWAY CANAL AERIAL FIGURES.

Elkhorn Main Canal

As under the ABFS Proposed Action, the Elkhorn Main Canal would be an improved reach of the existing main irrigation canal along the toe of the Garden Highway between the existing Prichard and Elkhorn Pumping Plant outfalls. However, unlike under the ABFS Proposed Action, the Elkhorn Main Canal would convey water from north to south. Water would be supplied from the Sankey Diversion via the Garden Highway Canal. Improvements would be configured to convey water from the Garden Highway Canal at the rate and level necessary to replace the existing supply. Approximately 10,460 LF of the existing main irrigation canal would be widened and raised from the Prichard Pumping Plant outfall to the Elkhorn Pumping Plant outfall. To meet conveyance needs, the water surface level at the Elkhorn Pumping Plant outfall take out would match existing levels.

All existing lateral irrigation canals and piped turnouts supplied off of the main canal between Prichard and the Elkhorn pumping plants would be restored. Peak design capacity varies within this reach of canal as water is turned out to supply adjacent fields and lateral irrigation canals. To match existing demands, the canal would be sized for a peak capacity of 210 cfs for the 3,460 LF reach between the Prichard Pumping Plant and the Lambert Ditch lateral, 200 cfs for the 2,600 LF reach between the Lambert Ditch lateral and the Elverta Road, and 185 cfs capacity for the 4,400 LF reach between Elverta Road and the Elkhorn Pumping Plant.

Typical canal sections for various reaches are shown in **Figure 2-19**. The canal would be unlined, with earthen embankments. The Elkhorn Main Canal embankments would provide one foot of freeboard at design capacity. To match the WSEL at the existing Central Main Flume takeout, at design flow, with a fall of no more than one foot in 10,000 LF, the design WSEL at the Elkhorn Pumping Plant outfall would be 28.5 feet. The footprint for the total cross section would be no more than 110 feet.

To provide for the increased conveyance capacity, the culverts for existing driveway crossings and Elverta Road would be upsized to double 6 by 5-foot concrete boxes. Existing irrigation turnouts, which are pipes through the field-side canal embankment with inlet gates for flow regulation, would be restored. Other irrigation and drainage facilities within the existing or new canal footprint (e.g. buried irrigation pipes, an irrigation well, drainage recirculation facilities) would be restored or avoided. The SMUD pole line, which runs along the field side toe of the existing canal, would be relocated.

Pumping Plant No. 3 and Riverside Main Canal

Improvements to Pumping Plant No. 3 and Riverside Main Canal under Alternative 1 would be the same as described under the ABFS Proposed Action.

Internal Drainage Canal Distribution System

Improvements would be made to the internal drainage canal system to provide for control and conveyance of water from the consolidated diversions to the points of usage. The features include:

- Making the following improvements to the County Line Check and Lift Pumps: replacing the gates to provide for additional conveyance and control, adding electric operators, and providing for remote monitoring.
- Reconstructing the Elkhorn Check and Lift Pumps to increase spill capacity, add gates for automation, and provide for remote monitoring.
- Adding water level gaging stations to the North Drainage Canal at Riego Road and the East Drainage Canal at Del Paso Road for remote monitoring of water levels.
- Dredging of the North Drainage Canal between V Drain and Riego Road.
- Enlarging culverts for three road crossings of the North Drainage Canal between the Pumping Plant No. 2 and the intersection with the East Drainage Canal.

Refer to the ABFS Proposed Action for additional discussion of the County Line and Elkhorn Check improvements and the proposed water level gaging stations.

To accommodate the routing of all of the drainage supply flows from a single diversion, the North Drainage Canal would be dredged between the V Drain and Riego Road (approximately 15,500 LF) to provide the conveyance capacity required for the increased flows. The peak flow through this reach would be approximately 260 cfs. An average of approximately 60 square feet would be added to the cross section in this reach to increase its capacity. The canal footprint would be unchanged and no tree removal would be required.

The culverts for the three road crossings between Pumping Plant No. 2 and the East Drainage Canal would be replaced with a double 6 X 6 foot box culvert. A temporary road closure, lasting about two months, would be required to replace the culvert under Powerline Road. The channel would be lined with rock for no more than 25 feet upstream and downstream of the culverts.

FACILITY DECOMMISSIONING AND REMOVAL

Existing irrigation facilities would be phased out as they are replaced with the proposed new facilities. The five existing pumping plants and the Verona Diversion Dam and Lift Pumps would be decommissioned as they are replaced by the new diversion facilities. These existing diversion facilities would remain operational until all testing and start-up is complete and the new diversions are fully operational. Please see Section 2.3.3: *ABFS Proposed Action* for additional discussion of the facility decommissioning and removal.

PROPOSED CONSTRUCTION APPROACH

Please see the discussion under Section 2.3.3: *ABFS Proposed Action*.

PROPOSED CONSTRUCTION METHODS

Please see the discussion under Section 2.3.3: *ABFS Proposed Action*.

2.3.5 ALTERNATIVE 2 - PRICHARD DIVERSION

Alternative 2 (Prichard Diversion) consists of constructing one new diversion with fish screens adjacent to the existing Prichard Pumping Plant (see **Figure 2-5**). Other changes to the distribution system for this alternative include:

- Constructing a new highline canal (Garden Highway Canal) from the new Prichard Diversion north along Garden Highway to Sankey Road.
- Constructing a new highline canal (Sankey Canal) along the landside of the NCC south levee from the Garden Highway Canal to the existing Northern Pumping Plant outfall, with a connection to the existing Bennett Main Canal at the Bennett Pumping Plant outfall, including a new turnout for the replacement supply to the Bolen Ranch Property.
- Re-grading the Elkhorn Main Canal between the new Prichard Diversion and the existing Elkhorn Pumping Plant outfall.
- Re-grading the Riverside Main Canal from the existing Riverside Pumping Plant outfall to Pumping Plant No. 3, and adding of one re-lift pump to the existing Pumping Plant No. 3 sump for replacement of the Riverside Pumping Plant supply.
- Improving the internal drainage canal system, including upgrading of two control structures, the County Line Check and Lift Pump and the Elkhorn Check and Lift Pumps.
- Enlarging culverts for three road crossings of the North Drainage Canal, between the Pumping Plant No. 2 and the intersection with the East Drainage Canal.

- Decommissioning and removing the existing Verona Diversion Dam and Lift Pumps.
- Decommissioning and removing the five existing Natomas Mutual diversions at the Northern, Bennett, Prichard, Elkhorn, and Riverside pumping plants, and the small privately-owned pump for the Bolen Ranch property.

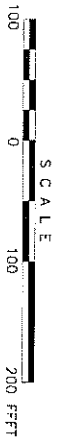
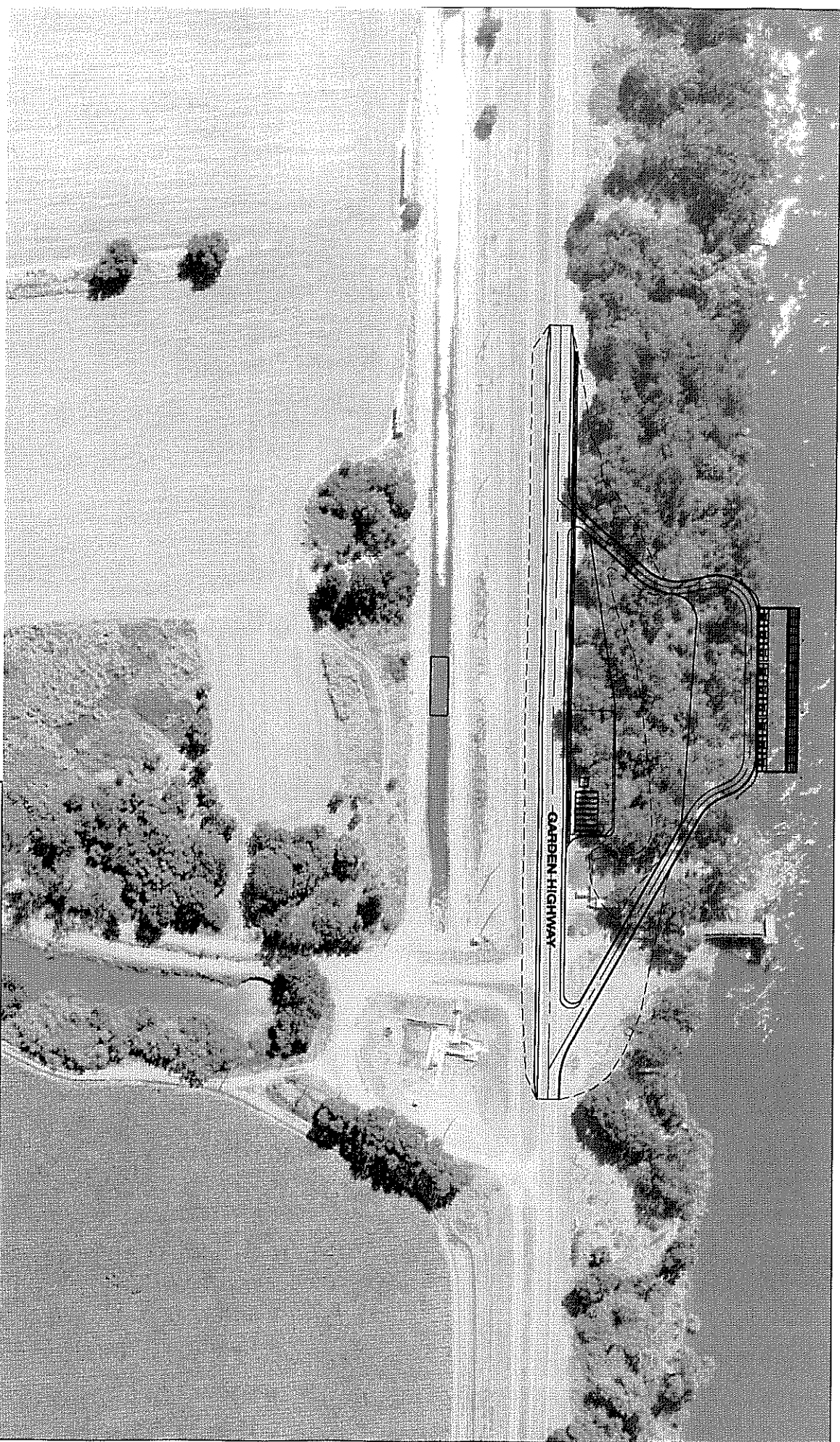
Alternative 2 would disturb approximately 139 acres, owned by both public and private entities. The following sections describe the Facility Characteristics, Construction Methods, and Operation of Alternative 2.

Prichard Diversion

The new Prichard Diversion would be a 644 cfs capacity pumping plant (at normal operating levels) with a state-of-the-art fish screen system. The facility would be located on the east (left) bank of the Sacramento River, adjacent to and downstream of Pumping Plant No. 2. The diversion and outfall are sited on property owned by RD 1000. The facility would displace the existing caretaker's house on the site. The intake facility would divert water from the Sacramento River and lift the supply into the Elkhorn Main Canal, Garden Highway Canal, and Sankey Canal (described in the following sections). The facility would also provide supply to the drainage canal system via a spill into the North Drainage Canal at Pumping Plant No. 2. The footprint of the proposed facility is shown in **Figure 2-20**.

The facility design is similar to the Elkhorn Diversion described under the Proposed Action, though it is sized for a larger capacity. The facility would have nine identical submersible lift pumps, discharging into the Elkhorn Main Canal system and the North Drainage Canal at flows and levels to meet demands. Pumps would be capable of automatic operation using variable frequency drives to adjust the pump motor speed as required to maintain set water levels in the Elkhorn Main Canal, Garden Highway Canal, and the North Drainage Canal to meet demands.

Similar to the Elkhorn Diversion, the Prichard Diversion intake would be equipped with a positive barrier fish screen inclined on a slope of 1.5 horizontal to 1 vertical foot. The intake facility would have nine pump bays with an overall screen face length of 190 feet as compared to 83.5 feet for the proposed diversion as described in the Proposed Action. Therefore, the overall length of the facility footprint under Alternative 2 would be 107 feet longer than the Elkhorn Diversion described in the Proposed Action. Otherwise, the intake facility characteristics are similar.



MEAD & MONT ENGINEERS 3001 Lehigh Drive, Sacramento, California 95833 Phone: (916) 775-3600 Fax: (916) 775-0378		NATOMAS MUTUAL WATER COMPANY		SCALE OF ORIGINAL 1"=100'
SUBMITTED JUNE, 2004	APPROVED SWS	AMERICAN BASIN FISH SCREEN AND HABITAT IMPROVEMENT PROJECT ALTERNATIVE 2 PRICHARD DIVERSION - SITE PLAN		

FIGURE 2-20

FIGURE 2-20

Sankey Canal

Alternative 2 differs from the Proposed Action and Alternative 1 because it does not include the Sankey Drain. The Sankey Canal characteristics would be the same as described for the Proposed Action, with the canal supplied by the new Garden Highway Canal, described below in lieu of the Sankey Diversion. The canal sections for various reaches are shown in **Figure 2-21**. The existing Vestal Drain would be relocated landward to accommodate the new highline canal, but would maintain its existing cross section and profile. The footprint for the total cross section would be no more than 150 feet between the Sankey Diversion and the Vestal Drain, 210 feet between the Vestal Drain and Plant 4, and 140 feet between Plant 4 and the Northern Main.

Garden Highway Canal

The Garden Highway Canal would be the same as described under Alternative 1, except that it would flow in the opposite direction. Instead of connecting the Sankey Diversion to the Elkhorn Main Canal, it would connect the Prichard Diversion to the Sankey Canal, which would serve the Bennett and Northern systems. Improvements would be configured to convey water from the Prichard Diversion at the rate and level necessary to replace the existing supply. Approximately 18,200 LF of the irrigation canal would be constructed from the Prichard Diversion to the beginning of the Sankey Canal adjacent to Sankey Road.

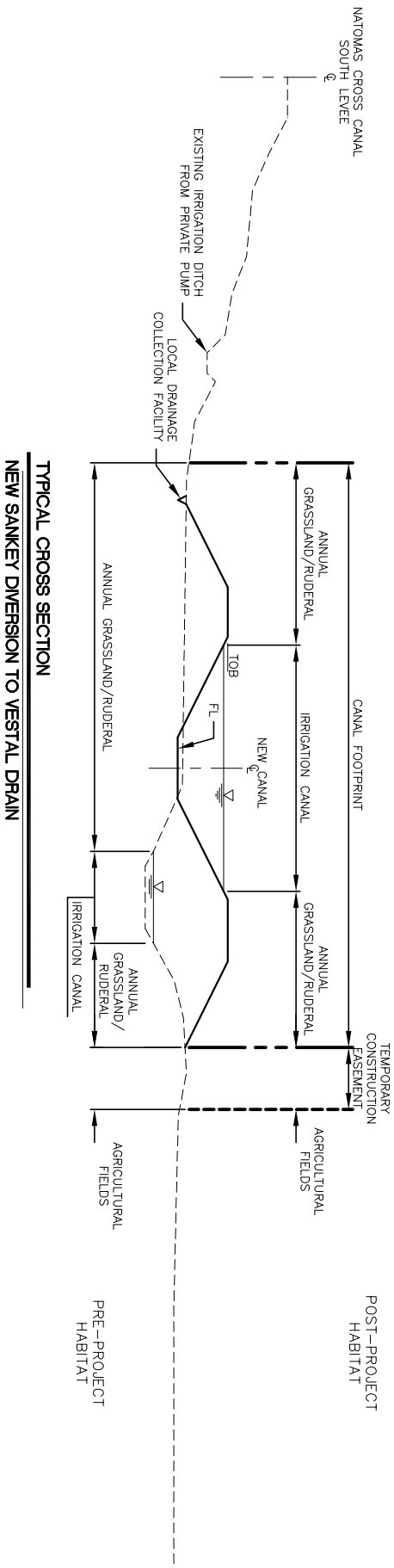
Similar to Alternative 1, all existing lateral irrigation canals and piped turnouts supplied off of the main canal between the Prichard Diversion and the Sankey Canal would be restored. Peak design capacity varies within this reach of canal as water is turned out to supply adjacent fields and lateral irrigation canals. To match existing demands, the canal would be sized for a peak capacity of 350 cfs between the Prichard Diversion and the Sankey Canal. A typical canal section for this reach is shown in **Figure 2-22**.

Elkhorn Main Canal

The Elkhorn Main Canal would be an improved reach of the existing main irrigation canal along the toe of Garden Highway. Under Alternative 2, the Elkhorn Main Canal would be the same as described under Alternative 1, except that the supply would be from the proposed Prichard Diversion. Typical canal sections for various reaches are shown in **Figure 2-23**.

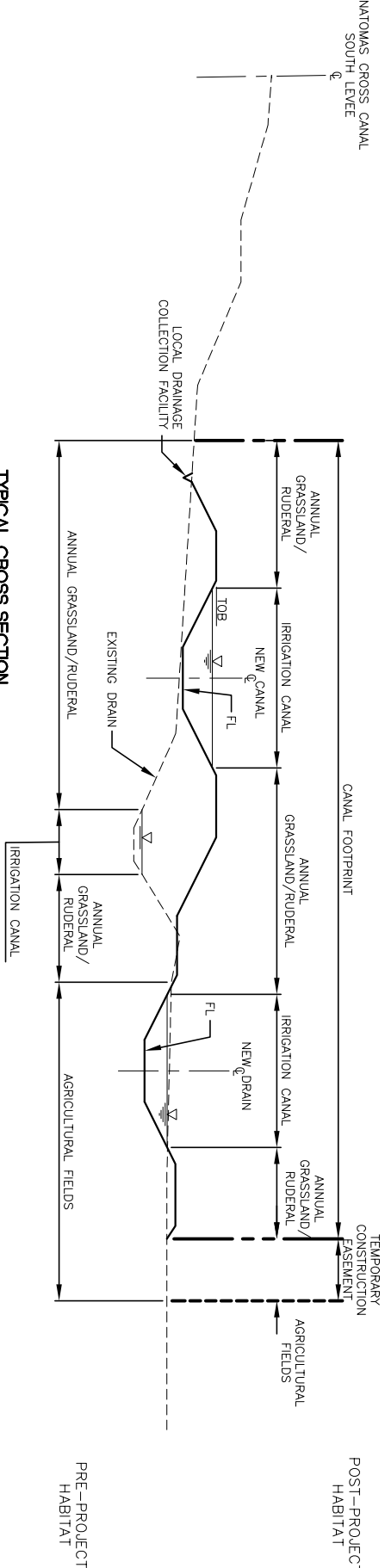
Pumping Plant No. 3 and Riverside Main Canal

Improvements to Pumping Plant No. 3 and the Riverside Main Canal under Alternative 2 are the same as described under the Proposed Action and Alternative 1.



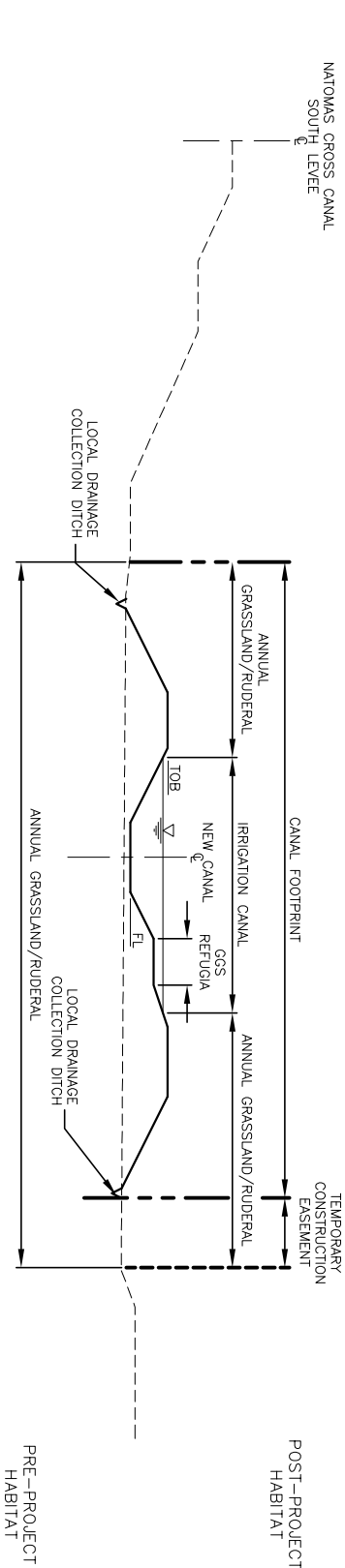
TYPICAL CROSS SECTION

NEW SANKEY DIVERSION TO VESTAL DRAIN




TYPICAL CROSS SECTION

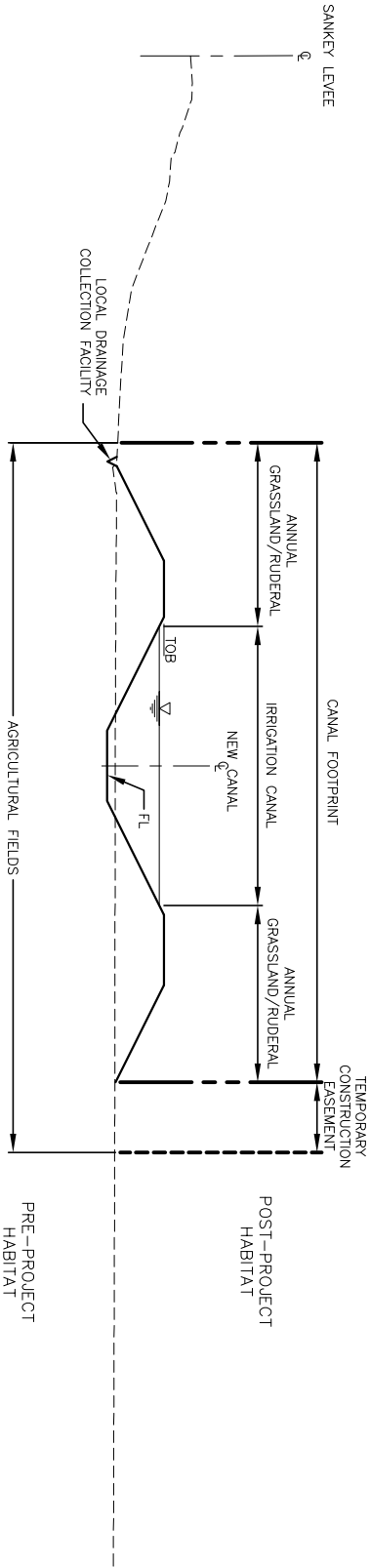
VESTAL DRAIN TO RD 1000 PUMPING PLANT NO. 4



TYPICAL CROSS SECTION

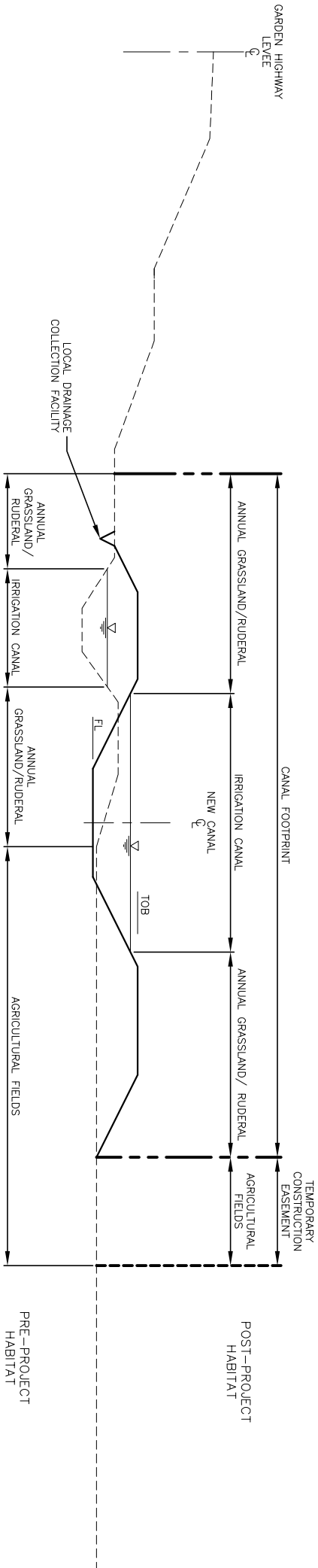
RD 1000 PUMPING PLANT NO. 4 TO NORTHERN PUMPING PLANT

 ENGINEERS SCIENTISTS PLANNERS		NATOMAS MUTUAL WATER COMPANY AMERICAN BASIN FISH SCREEN AND HABITAT IMPROVEMENT PROJECT ALTERNATIVE 2 SANKEY CANAL TYPICAL SECTIONS
3327 Longview Drive Sacramento, California 95821 Phone (916) 971-5961 Fax (916) 971-4578		
MAY, 2004		VERIFICATION BAR IS ONE HALF INCH ON ORIGINAL DRAWING, ADJUST SCALES FOR REDUCED PLOTS 0 1"
SUBMITTED		
APPROVED		FIGURE 2-21

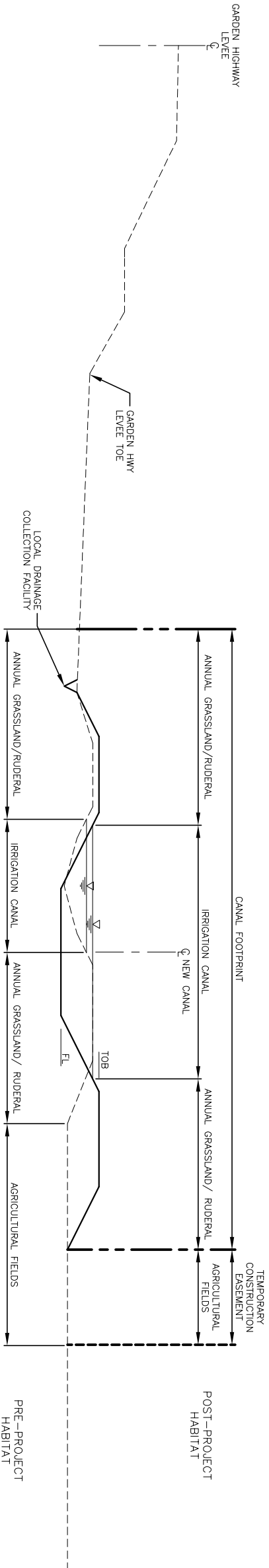


TYPICAL CROSS SECTION
PRICHARD DIVERSION TO SANKEY CANAL

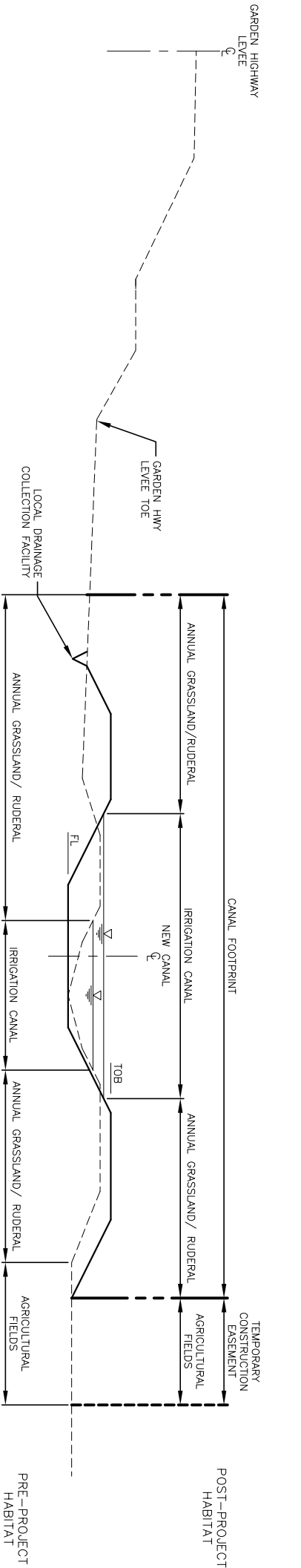
<div><div><div><div><div>MEAD</div><div>HUNT</div></div><div>ENGINEERS ARCHITECTS PLANNERS</div></div><div><div>3327 Longview Drive Sacramento, California 95821</div><div>Phone (916) 971-5961 Fax (916) 971-4578</div></div></div></div>		NATOMAS MUTUAL WATER COMPANY		<div><div>VERIFY SCALES</div><div>BAR IS TWO INCHES ON ORIGINAL DRAWING, ADJUST SCALES FOR REDUCED PLOTS</div><div><div>0</div><div>1</div><div>2</div></div></div>
<div><div>AMERICAN BASIN FISH SCREEN AND HABITAT IMPROVEMENT PROJECT</div><div>ALTERNATIVE 2</div><div>GARDEN HIGHWAY CANAL TYPICAL SECTION</div></div>				
<div><div>SUBMITTED</div><div>MAY, 2004</div></div>		<div><div>APPROVED</div><div>SRS</div></div>		FIGURE 2-22



TYPICAL CROSS SECTION
ELKHORN RESERVOIR TO LAMBERT DITCH



TYPICAL CROSS SECTION
LAMBERT DITCH TO APN 201-0140-064



TYPICAL CROSS SECTION
APN 201-0140-064

<div><div><div><div>MEAD & HUNT</div><div>ENGINEERS ARCHITECTS SCIENTISTS PLANNERS</div></div><div><div>3337 Longview Drive Sacramento, California 95821</div><div>Phone: (916) 971-3961 Fax: (916) 971-4575</div></div></div></div>		<div><div>NATOMAS MUTUAL WATER COMPANY</div><div>AMERICAN BASIN FISH SCREEN AND HABITAT IMPROVEMENT PROJECT</div><div>ALTERNATIVE 2</div><div>ELKHORN CANAL TYPICAL SECTIONS</div></div>	
<div><div>SUBMITTED</div><div>MAY, 2004</div></div>		<div><div>APPROVED</div><div>SRS</div></div>	
<div><div>VERIFY SCALES</div><div>BAR IS ONE INCH ON ORIGINAL DRAWING. ADJUST SCALES FOR REDUCED PLOTS</div><div>0 1"</div></div>		<div><div>FIGURE 2-23</div></div>	

Internal Drainage Canal Distribution System

Improvements to the internal drainage canal system under Alternative 2 are the same as under Alternative 1 and would be made to provide for control and conveyance of water from the consolidated diversions to the points of usage. The features include:

- Making the following improvements to the County Line Check and Lift Pumps: replacing the gates to provide for additional conveyance and control, adding electric operators, and providing for remote monitoring;
- Reconstruction of the Elkhorn Check and Lift Pumps to increase spill capacity, add gates for automation, and provide for remote monitoring; and
- Addition of water level gaging stations to the North Drainage Canal at Riego Road and the East Drainage Canal at Del Paso Road for remote monitoring of water levels.

Please see Section 2.3.3: *ABFS Proposed Action* and Section 2.3.4: *Alternative 1 – Sankey Diversion* for additional discussion of the above mentioned improvements.

FACILITY DECOMMISSIONING AND REMOVAL

Existing irrigation facilities would be phased out as they are replaced with proposed facilities. The five existing pumping plants and the Verona Diversion Dam and Lift Pumps would be decommissioned when they are replaced by the new diversion facilities. These existing diversion facilities would remain operational until all testing and start-up were completed and the new diversions fully operational. Please see Section 2.3.3: *ABFS Proposed Action* for additional discussion of facility decommissioning and removal.

PROPOSED CONSTRUCTION APPROACH

Please see the discussion under Section 2.3.3: *ABFS Proposed Action*.

PROPOSED CONSTRUCTION METHODS

Please see the discussion under Section 2.3.3: *ABFS Proposed Action*.

2.3.6 ALTERNATIVES CONSIDERED BUT ELIMINATED

Several types of alternative screening methods and alternative ways of consolidating diversions were considered, but an analysis of these alternatives by project engineers resulted in the determination that none of the options being considered adequately met the purpose and need, or they were technically, economically, or environmentally insufficient. A subsequent review of

the potential for screening the Prichard, Elkhorn, and Riverside diversions in place using cylindrical fish screens was subsequently conducted by Reclamation in 2005.

These alternatives and the reasons they were eliminated from further consideration are described below.

SCREEN EXISTING DIVERSION FACILITIES ALTERNATIVES

Based upon the ABFS project's Feasibility Study (Ensign & Buckley 2000), the option of simply adding fish screens to the existing facilities was considered and rejected for the following reasons:

- Construction of a fish screen is expensive and disruptive to the streambed. Thus, it would be more cost effective and environmentally preferable to consider options that consolidate existing pumping facilities into one or two new facilities with fish screens.
- The existing pumping plants on the NCC (Northern and Bennett) cannot be effectively screened in place, since the operation of these facilities draw water from the Sacramento River up the NCC, thereby creating a reverse flow condition which could lead to straying and stranding of fish migrating on the Sacramento River. Screening in place would also not be effective in preventing entrainment of migrants through the NCC, since the facilities create dead end flow conditions that could strand fish at the screens. Removal of the facilities from the NCC would restore a more natural flow regime and has therefore been identified by the resource agencies as a key component of the restoration of aquatic habitat conditions in the NCC.
- The Verona Dam and diesel pumps would have to remain in place for this scenario and their removal is a key component in the habitat improvement objectives of the ABFS Proposed Action. The dam is a potential migration barrier for fish attempting to reach east side tributaries through the NCC. Operation of the pumps could potentially lead to straying and stranding of migrating fish from the Sacramento River.
- Conditions at the Riverside Pumping Plant are not conducive to the siting of a fish screen facility and would likely provide less-than-optimal fisheries protection. The Riverside Pumping Plant is located in an area of the river where, at times, there is limited depth and velocity. There is also a large sand bar at the site that extends far out into the river.

CONSOLIDATE DIVERSIONS ALTERNATIVES

Other alternatives that involved the consolidation of existing structures, rather than modifications to existing facilities included:

- **Single Diversion at Elkhorn.** This alternative was eliminated from consideration because the site could not be properly configured to provide the necessary distribution service, due to a lack of ready access to the drainage canal system.
- **Diversions at Sankey, Prichard, and Elkhorn.** This alternative was eliminated since it would not provide the maximum benefit to aquatic habitat associated with diversion consolidation and is more expensive than the other alternatives. This alternative would only eliminate the need for improvements to the existing highline canal between the Prichard and Elkhorn pumping plants, while creating the more substantial short-term and long-term impacts associated with constructing and operating an additional diversion in the streambed.
- **Consolidation of Small Pump Diversions.** The consolidation of small pumps operated by individual landowners for diversion of water into the Natomas Basin was a project objective. The owners of these facilities were contacted to evaluate the potential for participation and the possibility of consolidation of these small diversions into the screened intakes proposed by the ABFS Proposed Action. Participation was not feasible for a number of landowners due to the estimated ongoing costs to deliver water from the new diversions. Other owners could not participate for timing reasons. The owner of several small pumps south of the Airport was interested in participating, but the ABFS Technical Team's evaluation concluded that participation was not feasible, due to the cost to consolidate these facilities. One small diversion (Bolen) would be consolidated into the Sankey Diversion under all of the three alternatives analyzed in this EIS/EIR.

CYLINDRICAL FISH SCREEN ALTERNATIVES

In 2005, Reclamation conducted a review of the potential for screening the Prichard, Elkhorn, and Riverside pumping plants in place using retractable cylindrical fish screens. Retractable cylindrical fish screens are self-contained units that are configured to fit over the pump intakes. Some retrofit of existing facilities is required for installation. Retractable screen units can be removed during periods of high debris load to prevent damage. The screening of the Northern and Bennett pumping plants in place on the NCC was not considered, since this configuration would not meet the project objectives related to improving habitat conditions in the NCC.

Based upon the results of the investigation, the use of cylindrical screens on the Prichard, Elkhorn, and Riverside Pumping Plants was not recommended (Reclamation and USFWS pers. comm.) The use of this screening technology was not considered feasible for reasons that included the following:

- Due to shallow river conditions at these sites, the screens would need to be located far out in the river channel, creating a potential boating hazard.
- Since the Natomas Mutual diversions are operated during periods of high debris load and the retractable screens would need to be in place during these conditions, the advantage of removable screens would be negated. Cylindrical screens that are in place during high debris conditions would be much more susceptible to damage than the conventional screens.
- The costs of these facilities were not shown to provide significant costs savings over the ABFS Proposed Action.

SACRAMENTO RIVER WATER RELIABILITY STUDY

A final alternative considered but eliminated from further study was the participation of Natomas Mutual in the Sacramento River Water Reliability Study (SRWRS). The potential for a future Sacramento River diversion is being evaluated by a number of local water users under this study. A joint project with the ABFS project is being considered by the SRWRS as one alternative. Due to the uncertainty regarding future coordination, funding, and timing for the SRWRS project, the ABFS project is moving forward independently of the SRWRS.